

DIVISION OF AQUATIC RESOURCES

FY 1999, 2000, 2001

William S. Devick, Administrator



*Fishing fun in Hawai'i spans generations.
Photo credit: the DAR*

ROLE AND ORGANIZATION

The Division of Aquatic Resources (DAR) is charged with managing aquatic resources along the fourth longest coastline in the United States, including 410,000 acres of coral reef, and 565 million acres of ocean. More than 80% of the coral reefs located within the U.S. are found in Hawai'i. A wide range of beautiful tropical fish are found in these islands, including a high percentage of endemic species found nowhere else in the world. Hawai'i is also home to the successful Hawaiian Islands Humpback Whale National Marine Sanctuary - which received a five-year renewal in 2002 - and the recently established Northwestern Hawaiian Islands Ecosystem Reserve.

Fiscal years 1999, 2000 and 2001 provided new and varied opportunities for the per-

sonnel of the Division of Aquatic Resources. The focus of the division has continued to shift from its historic role of fresh and saltwater fisheries around the main Hawaiian Islands for

- The DAR manages the 4th longest coastline in the United States.
- 80% of the coral reefs located in the United States are found in Hawai'i.
- Widespread use of legal and illegal gill nets has contributed to over fishing in near shore waters.
- New rules are being devised for fishing in the Northwestern Hawaiian Islands.
- Many of Hawai'i's pelagic fish stocks are being fished at sustainable levels.

commercial and recreational purposes, to programs that emphasize resource protection and enhancement.

The Division of Aquatic Resources has 50 employees and offices located in Kaunakakai, Honolulu, Lihue, Kahului, Hilo and Kona. The Division has boats in each of its districts. The division operates the 'Anuenue Fisheries Research Center (AFRC) on Sand Island in Honolulu, and manages 53 fish aggregating devices (FADS) 19 Fisheries Management Areas and 10 Marine Life Conservation Districts. (MLCD) 9 fish replenishment areas (FRA's), 19 bottomfish restricted areas and 1 refuge.

PROGRAM OVERVIEW

The Division's three programs include commercial fisheries management for sustainability basis in both the main Hawaiian Islands and the Northwestern Hawaiian Islands, the protection of native and indigenous aquatic species and their habitats, and providing facilities and opportunities for recreational fishing.

SURVEY OF RESOURCES

The division budget is \$5 million, of which \$2 million comes from state funds and the remaining \$3 million is provided by the following federal programs: the Dingell-Johnson Sportfish Restoration Act and the National Oceanic and Atmospheric Administration (including the Hawaiian Humpback Whale National Marine Sanctuary, National Ocean Service, and National Marine Fisheries Service), and the U.S. Fish and Wildlife Service.

State of Hawai'i's Ocean 1998-2001

Hawai'i's marine environment is impacted by a variety of problems. These include the widespread use of legal and illegal

gill nets (overfishing), pollution, and siltation from agricultural and coastal development projects, invasive fauna and flora, and the over-use of some areas by the public as a result of ecotourism. Historically, marine resource management in the state has facilitated the take of resources for sale or recreation. Because these levels of use are no longer sustainable, the division is now emphasizing restoration of marine resources and protection of rare and endemic species.

Although existing regulations limit the time that gill nets may be set, they have been difficult to enforce and voluntary compliance has been relatively weak. To better manage the use of these nets in Hawai'i, the Department of Land and Natural Resources (DLNR) convened a gill net task force to review issues concerning use of laynets and make recommendations for changes to lay net regulations statewide. The task force objective is to improve controls on gill net use and encourage more responsible fishing practices that prevent waste of marine life and promote the ability of fish populations to reproduce.

Hawai'i has approximately 4,000 licensed commercial fishers. The recreational fishery is estimated to include as many as 260,000 participants. However, most of this catch data have been unrecorded. Because the commercial and recreational fisheries often overlap, the lack of accurate recreational data limits effective fisheries management and resolution of fishery allocation issues. A marine recreational fishery and census program has been implemented to rectify this situation. The Division maintains the actual database on commercial fish catches derived from catch reports required of all commercial fishers.

The populations of some pelagic fishes around Hawai'i, including tuna and marlin, are at sustainable levels. Large-scale commercial longline fishing has been significantly reduced in the last year as a result of federal court orders. The reduction in the number of fishing

vessels has had a significant impact on the commercial fishing industry.

The health of Hawai'i's aquatic resources also impacts marine tourism. Diving and snorkeling activities are very popular among both visitors and residents. Having areas where reefs and fauna are protected attracts visitors, but as a result, overuse and overcrowding at some popular snorkeling and diving spots have led to habitat degradation and user conflicts. A balance between resource protection and public use must be achieved.

Pollution is another problem that affects fish and coral ecosystems. There are 1.2 million people in Hawai'i. Approximately 80% of the people in the state live on the island of O'ahu. The majority live only a few miles from the coastline. The responsibilities for monitoring pollution are shared between multiple agencies. As island populations continue to grow and develop, the means by which land-based runoff and sewage outfalls are managed will have significant effects on water quality and the marine environment. The increase in nutrients in off-shore areas such as West Maui is thought to have contributed to native algae blooms such as *Cladophora*.

MARINE FLORA

There are nearly 600 species of algae (limu) and two species of seagrass in Hawai'i waters. Approximately 25% of the seaweed species are endemic, including the sea grasses, *Halophila hawaiiiana*.

One significant problem affecting native marine flora is the presence of alien and invasive seaweeds that have significantly altered native coral habitats. Scientists are just now determining the costs of invasive alga populations in vital tourism areas such as West Maui, Kane'ohe Bay and Waikiki beach. In these areas, coral reef life has been threatened and native ecosystems have been changed as a result of the alien species out-competing native algae.

Acanthophora spicifera, *Hypnea musciformis*, *Gracilaria salicornia*, *Kappaphycu Gracilaria* and *Kappaphycus* are algae that were introduced in the early 1970's as part of a University of Hawai'i experiment, and are now established on our reefs. An impact of the fast-growing invasive algae is that they displace native species and thus transform a native coral-dominant reef ecosystem into an algal-dominant ecosystem, thus displacing native reef species. A second problem affecting native algae involves the alteration of primary habitat necessary for their survival from activities such as over-fishing, over-collection of limu, and runoff from coastal development that suffocates reef habitats. To reverse this trend, the division is working with the University of Hawai'i Department of Botany to grow native marine limu for eventual re-introduction, and is actively developing techniques to assist in the eradication of these alien algae.

MARINE FAUNA

There are an estimated 6,000 fish and invertebrate species, in addition to a wide variety of marine mammals such as humpback whales, monk seals, and dolphins, and at least five species of sea turtles and one species of sea snake (*Pelagia pelamis*).

Challenges to the health of marine fauna populations also come from impacts of human activities on nearshore waters, which include fishing pressure, runoff and coastal development, change of available habitat and from introduction of alien species.

To address declining fish populations, the Division is using the latest research on what size fish are when they first reproduce. To ensure that fish are not taken below their reproductive size, the division is proposing to amend the minimum size regulations for various fish species.

Additionally, the division is conducting active research and assessment on the status of

economically valuable marine species such as deepwater snappers.

HIGHLIGHTS

Reef studies

During fiscal years 1999, 2000 and 2001, the Division of Aquatic Resources went through a number of significant changes. First and most significant was the start of extensive reef study programs made possible by support from the Hawai'i Coral Reef Initiative (HCRI). Among the projects funded was the West Hawai'i Aquarium Project, in which division biologists are studying the effectiveness of nine new fish replenishment areas - established in December 1999 - where aquarium fish collecting is prohibited.

Bottomfish stocks research

State and federal funds enabled division biologists to conduct extensive research on bottomfish stocks that were depleted from years of fishing pressure. The deep-sea red snappers, the onaga, or 'ula`ula koa'e (*Etelis coruscans*), and the ehu, or 'ula`ula (*Etelis carbunculus*) are the focus of division efforts to implement a comprehensive management program. These fish are found throughout the Hawaiian archipelago generally at depths between 100 to 150 fathoms (600 - 900 feet). They can occasionally be caught deeper. They are considered to be part of the Hawaiian bottomfish fishery, which also includes other deep dwelling snappers, groupers, and jacks on vertical handline gear, sometimes operated with electric or hydraulic reels.

The division collects various data for use in monitoring and assessing the status of aquatic resources. It does this through catch reports from fishermen, marine life and habitat surveys (fish counts/transects, etc.), creel surveys, port surveys, fish market sampling, and

other scientific surveys.

Commercial Catch Reports

The largest and oldest data set the division maintains is that of the commercial marine landings. These have been collected, compiled, and archived continuously since 1948.

Fishermen who take marine life for commercial purposes must have a valid commercial marine license and are required to report their fisheries effort, catch, and sales on a commercial catch report form (Hawai'i Revised Statutes Chapter §189-2,3). These data are used extensively by DAR and a few authorized fisheries management agencies for monitoring fisheries and assessing the health of the resources. They are especially valuable because they are such a long time-series and thus provide a good source for analyzing trends.

During the period 1998-2001, changes were instituted in fish catch data collection methods and analysis. New catch forms and an instructional video were given out to fishermen and dealers which will provide a more accurate report of the time it took the fisherman to land his catch (catch per unit effort). This is an indicator of abundance of fish stocks.

Endangered Species

New funding sources from the National Oceanic and Atmospheric Administration have enabled DAR to monitor and protect threatened and endangered species. This means more attention to dolphin, whale and monk seal strandings. An incidental take permit application for sea turtles has been submitted to the National Marine Fisheries Service to comply with federal endangered species regulations. Failure to meet requirements that could be imposed under the permit could shut down fishing in state waters.

Minimum size regulations

A new set of minimum size take laws for thirteen popular fish species has been proposed. The proposed rules will affect a number of commonly caught species. The new minimum size recommendations are based on scientific information about the species reproductive cycles. The minimum take size for mullet for example will go from seven inches to twelve inches, for moi from seven inches to eleven inches, for uhu from one pound to twelve inches and for pāpio, (juvenile version of ulua), from seven inches to ten inches.

Offshore cage aquaculture

Since 1998, DAR has been monitoring a pilot project conducting offshore culture of moi in pens off O`ahu. The growth of offshore pen culture offers the promise of a new industry. However, excess waste generated by the captive population must be monitored to avoid harm to the marine ecosystem.

COMMERCIAL FISHERIES AND AQUACULTURE PROGRAM

PROGRAM DESCRIPTION

This program supports commercial fisheries through analysis of catch patterns and development of methodologies to sustain and enhance commercial fisheries.

PROGRAM ACCOMPLISHMENTS FY 1999

- Monitored and maintained 59 fish aggregating device (FAD) sites statewide. 1,031,483 pounds of pelagic fishes were reported caught around the FADs in 8,650 fishing trips. Thirty-six FADs were replaced, and light pack maintenance was performed for on-station FADs.
- Released coded-wire tagged moi into

Waikiki-Diamond Head Shoreline Fisheries Management Area (SFMA) for planned 2000 fishing opening.

- Released coded-wire tagged moi into Honomanu Bay and Wailua Bay in east Maui. Coordinated with local group in monitoring, sampling, and collecting of tagged moi caught within the `ahupua`a and neighboring districts.

- Released coded-wire tagged mullet fingerlings into Hilo Bay and adjacent sites.

- Began collection of kumu, `ōmaka, akule, `āholehole, and other species for broodstock for potential stock enhancement.

PROGRAM ACCOMPLISHMENTS FY 2000

- Monitored fish population trends within Waikiki-Diamond Head SFMA; conducted monthly sampling to determine movement behavior of tagged moi within area, and to keep fishermen informed of state's stock enhancement efforts.

- Monitored coded-wire tagged moi trends within Honomanu Bay and Wailua Bay at Ke`anae, Maui. Initiated monitoring, sampling, and collection of tagged moi caught within these areas.

- Successfully spawned kumu (*Parupeneus porphyreus*), the popular and highly-prized goatfish, in captivity. Conducted larval rearing experiments to develop mass culturing procedures to raise this species.

PROGRAM ACCOMPLISHMENTS FY 2001

- From November 1999-October 2000, approximately 10,000 moili`i (*moi juveniles*) Pacific threadfin (*Polydactylus sexfilis*), cultured from

wild captured broodstock, were tagged and released within the Waikīkī-Diamond Head Shoreline Fisheries Management Area (FMA). The moili'i were tagged with both a coded wire tag (CWT) and a visual implant tag (VI) to determine individual cohorts. No recreational catches of cultured fish was reported during the study period. However, wild legal sized moi was caught by a gill net fisherman just outside of the Diamond Head end of the marine reserve suggesting the cultured moi may be migrating to the outer reefs as they get larger making it more difficult to track with routine cast net sampling methods.

■ A report titled, "Preliminary Investigation into the Enhancement of the Pacific Threadfin, Moi (*Polydactylus sexfilis*), Population within the Waikīkī-Diamond Head Marine Reserve, O'ahu, Hawai'i" was completed. The study indicated 1) that tagged cultured moi released within the marine reserve stayed near shore for at least a month before venturing out along the coastline, 2) the tagged cultured moi mixed well with the existing wild moili'i population within the reserve and over time dispersed outside of the marine reserve, and 3) the best moi catch per unit effort (CPUE) was observed within the Waikīkī War Memorial Natatorium release site.

■ Wild moili'i were captured and raised at the Anuenue Fisheries Research Center (AFRC) for broodstock. Moi are protandric hermaphrodites undergoing sex reversal from male to female with age. Variations in age of reproductive maturity exists. Periodic biopsy indicated sexual maturity as a male within 7 months, sex reversal within 12-18 months, and a mature reproductive female by 24 months.

■ In September '99, approximately 6,000 cultured and tagged (CWT and VI) moili'i (*Polydactylus sexfilis*) were released into Honomanu Bay and Wailua Bay along the Ke'anae, Maui coastline. This study was initiated

to generate preliminary information on the potential stock enhancement of moi in this area. Routine monthly sampling was difficult to conduct because of inclement weather and occasional "hazardous" ocean conditions, especially during the winter months. During the study period, none of the cultured moi was captured/reported by recreational fishermen or observed during periodic sampling conducted by the AFRC staff. The only reported recreational catch was a wild moi (~2 lbs.) that was caught with rod-reel by a Ke'anae fishermen in Wailua Bay.

■ Successful spawning of kumu (*Parupeneus porphyreus*), a popular goatfish, in captivity was attained in 2000. Initial attempts to culture the newly hatched larvae utilizing standard AFRC marine finfish (moi, akule, mahimahi, mullet, etc.) culturing procedures utilizing rotifers have not been successful. Poor larval survival of <6% after 9 days posthatch strongly suggest larval starvation. The kumu larvae nutritional requirements appears much more complex than other marine species we have cultured. The larvae appear to require a smaller (<70 um) live feed at first feeding. Future larval rearing experiments will focus on the use of alternative smaller "first-feed." organisms such as oyster trochophores and copepods.

■ Monitored and maintained 59 fish aggregating device (FAD) sites statewide. Thirty- FADs were replaced.

AQUATIC RESOURCES PROTECTION PROGRAM

PROGRAM DESCRIPTION

This program preserves and enhances native and other resident fish and aquatic species, including their habitats, through active protection and other management measures.

PROGRAM ACCOMPLISHMENTS FY 1998-99

- Established West Hawai'i Regional Fisheries Management Area, which closed 35% of West Hawai'i coastline to aquarium fish collecting and fish feeding.
- Amended Hilo Bay and Waiākea Public Fishing Area administrative rule to include Mohohuli fishpond. Established bag limit for mullet and prohibited snagging of fish.
- Established new administrative rules chapters in preparation for transfer of fishing regulations from statutes to rules.
- Supported Act 9, which amended statutes on commercial fishing report requirements to prepare for amendments to report forms.
- Supported Act 85, which generally transferred fishing regulations in statutes to administrative rules.
- Supported Act 195, which amended criminal penalties for fishing violations by establishing minimum fines, graduated fines for repeat offenders, and increased penalties for unlawful fishing with chemicals, electricity, and explosives.
- Supported Act 233, which established new procedures for DOCARE to allow sale of certain catches in place of having to store catches

as evidence.

- Supported Act 234, which authorized DLNR to prohibit the landing of lobsters from the NWHI if lobsters did not meet State regulations.
- Formed Pūpūkea Task Force for purpose of recommending changes to administrative rules for Pūpūkea Marine Life Conservation District.
- Supported Gill Net Task Force, which was formed for the purpose of recommending changes to existing gill net regulations.
- Formed akule working groups on Kaua'i for purpose of resolving user conflicts.
- Formed community-based West Hawai'i Fisheries Council to serve as marine resource advisory group for developing and recommending additional West Hawai'i management actions.
- Developed West Hawai'i Aquarium Project to investigate effectiveness of fishery replenishment areas to sustainably manage the aquarium fishery.
- Developed and implemented extensive long-term monitoring methodologies for West Hawai'i and Maui reefs.
- Responded to incidents to document environmental disturbance or damage: Tesoro Single Point Mooring oil spill off Kaua'i; Paradise Queen II lobster boat grounding on Kure Atoll Reef; Van Loi longline fishing vessel grounding on Kaua'i reef.
- Removed abandoned fishing nets snagged on reefs in Hanauma Bay.
- Conducted aquatic resource curriculum workshops for teachers on O'ahu, Maui, and Hawai'i; reached nearly 3,000 students through

classroom presentations; conducted conservation education courses for nearly 2,000 participants; reached thousands of general public through displays at various events; distributed over 65,000 pieces of printed material.

- Continued airing 30-second television spots on catch-and-release, fishing safety, marine debris, and the problems associated with the release of exotic fish into our streams.

- Produced division newsletter Currentline to provide communication link with fishermen about division's programs and projects.

- Supported research on the impacts of alien algae on coral reefs.

- Organized and participated in several community net clean-up efforts.

- Continued compilation of biological, fisheries and ecological data needed to develop recommendations to revise and improve existing fisheries regulations.

- Began developing recommendations to improve existing inshore fisheries management, based on sound biological and ecological data compiled throughout the past decade and representing a 50-80 year regional historical database (varies by location) for five target areas of the Main Hawaiian Islands.

PROGRAM ACCOMPLISHMENTS FY 2000

- Held public hearing to amend administrative rules for Mānele Harbor Fishery Management Area and Mānele-Hulopoe Marine Life Conservation District.

- Drafted final recommendations for amendment to Pūpūkea Marine Life Conservation District; returned recommendations to Pūpūkea

Task Force for final approval prior to public meetings.

- Gill Net Task Force approved final recommendations for changes to gill net regulations; submitted to department for consideration.

- Drafted management plan for akule to resolve user conflicts and better manage akule resources statewide.

- Supported Act 121, which establishes a permanent commercial fisheries special fund for deposit of all commercial license fees.

- Supported Act 134, which establishes DLNR as the State's lead agency to manage exotic introductions via ship fouling and ballast water.

- Supported Act 277, which prohibits the harvesting of shark fins and landing fins in the State unless sharks are landed whole.

- Amended administrative rules for pink, gold, and black corals to provide for better management of deepwater precious corals.

- Provided advice to Hawai'i Coral Reef Initiative research program on selection of projects that would identify major impacts to coral reefs and advance the understanding of processes affecting coral reef health.

- Responded to incidents to document environmental disturbance or physical damage: Sunflower III longline fishing vessel grounding on reef off Kewalo Basin, O'ahu; release of sulfuric acid by Brewer Chemical, Campbell industrial Park, O'ahu; jet fuel spill on Kāne'ohe Marine Corps Air Station, O'ahu; recreational sailboat groundings on coral reefs off O'ahu; Swordman I longline fishing vessel grounding on Pearl and Hermes Reef in Northwestern Hawaiian Islands.

■ Processed and approved 42 permit renewal applications for commercial operators conducting snorkel and SCUBA charters within Molokini Marine Life Conservation District.

■ Participated in joint federal-state marine survey of corals in and around Mā`alaea small boat harbor, Maui.

■ Reactivated State Shark Task Force in response to increased numbers of shark incidents during 1999.

■ Continued fish census work on 20-year comparative study in South Kona.

■ Assisted in Mahai`ula anchialine pond restoration.

■ Continued extensive monitoring of the West Hawai`i coastline to determine effectiveness of newly established FMAs in designated "no aquarium collection" zones.

■ Conducted aquatic resource curriculum workshops for teachers on O`ahu, Maui, and Hawai`i; reached nearly 3,000 students through classroom presentations; conducted conservation education courses for nearly 2,000 participants; reached thousands of general public through displays at various events; distributed over 65,000 pieces of printed material.

■ Worked with staff of Arizona Department of Game and Fish to produce new video public service announcements on marine topics. Continued airing 30-second television spots on catch-and-release, fishing safety, marine debris, and release of exotic fish.

■ Supported research on distribution of mushroom coral and water quality in Kāne`ohe Bay, O`ahu.

■ Supported research on coral trampling at

high, medium, and low use tourism areas to determine total impact of walking across reefs. Results indicated that in high use areas new coral recruitment is nearly impossible, as trampling causes 100% die-off.

■ Completed compilation of biological, fisheries and ecological data needed and began developing recommendations to revise/improve existing fisheries regulations. Recommendations entered a scoping phase that entails intra-agency discussions to refine recommendations into new administrative rules.

PROGRAM ACCOMPLISHMENTS FY 2001

■ Conducted a public meeting and hearing on Lana`i for proposed changes to administrative rules regulating Mānele Harbor and Mānele-Hulopoe Marine Life Conservation District.

■ Administrative rules were established to create the West Hawai`i Regional Fishery Management Area along 147 miles of the west coast of the Big Island. The rules established nine fish replenishment areas (FRAs) where tropical reef fish collecting is now prohibited. The purpose of the rules are to prevent overfishing of these prized species which are popular in the aquarium trade and among commercial and recreational divers.

■ Conducted aquatic resource curriculum workshops for teachers; reached over 2,900 students through classroom presentations; conducted conservation education courses for nearly 1,300 participants; reached thousands of general public through presentations and displays at various events; distributed over 65,000 pieces of printed material; produced new educational poster on Hawai`i's jacks and their allies.

■ Continued airing 30-second television spots on catch-and-release, fishing safety, marine

debris, and release of exotic fish; produced new spots on fishing conservation and gill nets.

- Held a video conference with staff to discuss recommendations made by the Gill Net Task Force.

- Meetings and video conferences were scheduled in May, June, and July 2001 with Division of Conservation and Resources Enforcement officers on Hawai'i, Maui, Kaua'i and O'ahu to discuss recommendations made by the Gill Net Task Force.

- The edited draft of proposed rules was sent out to Gill Net Task Force members in FY 2001 for final comment.

- Conducted impact assessment of Hokulia (North Kona) development sedimentation events.

- Continued bimonthly fish and invertebrate censuses of 23 sites as part of West Hawai'i Aquarium Project (WHAP).

- Assisted in development of NOWRAMP Northwest Hawaiian Islands assessment protocols.

- Supported advisory role of community-based West Hawai'i Fisheries Council (WHFC) in 16 public meetings.

- Supported Washington State University study on impacts of recreational fish feeding.

- Supported University of Hawai'i research on the influence of nutrients on algal growth.

- Supported monitoring efforts of the Coral Reef Assessment and Monitoring Program (CRAMP).

- Continued monthly fish censuses of Ke'e'i

(South Kona) 20 year comparison study.

- Completed third year of summer fish censuses of Hōnaunau (South Kona) 20 year comparison study.

- Assisted in development of monitoring protocols for coral reefs under jurisdiction of U.S. National Park Service.

- Participated in the NOWRAMP ecological survey and assessment of Northwest Hawaiian Island coral reefs.

- Supported University of Hawai'i Quantitative Underwater Ecological Survey Techniques course (QUEST).

- Supported multi-agency task force developing boating and use rules for Kealahou Bay.

- Assisted in development of volunteer coral reef monitoring protocols and supported "ReefWatchers" in their monitoring efforts.

- Initiated installation of "manta mooring" to reduce coral damage at Kealahou Bay.

- Opened Division of Aquatic Resources office in Kona.

RECREATIONAL FISHERIES PROGRAM

PROGRAM ACCOMPLISHMENTS FY 1999

- Conducted fish surveys, surveys of resource impacts, monitoring of Marine Life Conservation Districts, artificial reefs, and Natural Area Reserves resources at locations statewide.

- Constructed over 3,000 "z-shaped" fish habitats from more than 2,100 cubic yards of donat-

ed concrete; added most of the habitats to Maunalua Bay Artificial Reef. Placed about 850 habitats at Wai`anae Artificial Reef.

- Scuttled three 110-foot landing craft, two at Wai`anae Artificial Reef and one at Maunalua Bay. Monitored resident fish populations at artificial reefs on O`ahu and Keawakapu on Maui.

- Surveyed fishermen to identify species caught, type of gear used and overall fishing pressure during 1998 opening of Waikiki-Diamond Head Shoreline Fisheries Management Area. Monitored fish population trends. Closed area to fishing January 1, 1999.

- Surveyed fishermen to identify and collect tagged adult mullet landed in the Hilo recreational fishery.

PROGRAM ACCOMPLISHMENTS FY 2000

- Conducted fish surveys, surveys of resource impacts, monitoring of Marine Life Conservation Districts, artificial reefs, and Natural Area Reserves resources at locations statewide.

- Completed marine resource inventory within Ahihi-Kinau Natural Area Reserve and developed a fishing report form for use in monitoring fish take within the NAR for permit issued by Department.

- Constructed 3,675 “z-shaped” fish habitats from 2,752 cubic yards of donated concrete and added most, along with small 60-foot barge, to Kualoa artificial reef. Placed 1,400 tons of old pier pilings at Maunalua Bay artificial reef.

- Monitored resident fish populations at artificial reefs on O`ahu and Maui.

- Initiated study to describe recruitment of

native striped mullet fingerlings and alien summer mullet in Wailoa River system, Hilo.

- Constructed 2,100 “Z-shaped” fish habitats from 1,470 cubic yards of donated concrete and added 1,714 habitats to the Maunalua Bay and 1,576 habitats to the Wai`anae artificial reefs off O`ahu.

- Identified a potential new artificial reef site off Kalaeloa (formerly Barbers Point), O`ahu.

- Monitored resident fish populations at artificial reefs on O`ahu and Maui.

- Produced 3 issues of division newsletter Current Line (issues July 2000, November 2000, March 2001)

- The Ulua Tagging Project: successfully recruited 99 volunteer taggers, distributed 2,311 tags, distributed 99 tag kits, tagged 870 fish, and collected 81 recoveries.

HAWAIIAN ISLANDS HUMPBACK WHALE NATIONAL MARINE SANCTUARY

Jeff Walters Co-Manager

PROGRAM OVERVIEW

The Hawaiian Islands Humpback Whale National Marine Sanctuary was established by Congress in 1992 to protect humpback whales and their habitat in Hawai'i. The Sanctuary has been managed cooperatively as a federal-state partnership since 1997, when Governor Ben Cayetano approved the Sanctuary's Management Plan in state waters. The Department serves as the lead state agency in "co-managing" the Sanctuary with its federal partner, the National Oceanic and Atmospheric Administration (NOAA). The Sanctuary covers over 1,400 square miles of ocean in selected areas around Kaua'i, O'ahu, Maui, Lāna'i, Moloka'i and the Big Island.

To best protect Hawai'i's endangered humpback whales, the Sanctuary uses non-regulatory, community-based activities emphasizing scientific research and public education and outreach. As part of its participatory conservation approach, the Sanctuary responds to extensive input from its 25-member Sanctuary Advisory Council, which includes a wide variety of non-government stakeholder (shipping, fishing, Native Hawaiian, ocean recreation, etc.) representatives. The Sanctuary also coordinates the activities and policies of numerous state and federal agencies (DOH, DOT, OHA, DBEDT, NOAA, U.S. Navy, U.S. Coast Guard, U.S. Army Corps of Engineers, etc.) to ensure efficient and effective ocean policy implementation and protected species law enforcement.

The Sanctuary currently employs 10 full-time federal staff and 2 full-time state staff. The state Sanctuary office is organizationally placed in the Chairperson's Office and housed administratively within the Division of Aquatic Resources. The annual budget of the state office

has averaged approximately \$240,000 since 1998.

Humpback Whales in Hawai'i

Hawai'i is home to the largest breeding population of humpback whales in the North Pacific Ocean. As of 2001, approximately 4,500 humpbacks, or more than two-thirds of the entire North Pacific stock, spend the winter months (November through March) in Hawai'i's waters, breeding and nursing their young.

Attracting thousands of visitors and residents to Hawai'i's marine environment, humpback whales are among Hawai'i's most valuable natural economic assets. The state's growing humpback whale watching industry generates more than \$20 million annually in local, private sector revenues. The importance of humpback whales in native Hawaiian culture is also noteworthy. For instance, the koholā (humpback whale) is revered as an 'aumakua (ancestral deity) by some Hawaiian families and koholā is referred to in the kumulipo (the Hawaiian creation myth).

Although the North Pacific humpback whale is still classified as an endangered species, there are some promising signs of recovery. Sanctuary-sponsored research indicates that the population is currently growing at a rate of about 7 per cent per year. However, there are several threats to humpback whales that are persistent, if not increasing in severity. Becoming fatally entangled in marine debris (rubbish, discarded fishing gear, etc.), being struck by passing ships, and/or being unintentionally disturbed by curious recreational boaters are still real and present dangers for Hawai'i's humpbacks - dangers the Sanctuary is committed to address.

HIGHLIGHTS AND ACCOMPLISHMENTS

Co-managing the Sanctuary since 1997, the department has promoted the recovery of endangered humpback whales and fostered their continued contribution to Hawai'i's culture and economy. Some significant accomplishments include:

■ **Applied Conservation Science and Research** - Over 20 scientific research projects have been funded by the Sanctuary, with the state Sanctuary office recently producing 4 groundbreaking studies, providing the latest information on Hawai'i's whale population, distribution, migration and behavior. One important finding - humpbacks don't come to Hawai'i en masse in the fall, but rather arrive in distinct groups depending on their age, sex and reproductive status, among other factors.

■ **Public Outreach and Education** - By hosting public events and activities attended by thousands each year, as well as placing numerous feature stories and programs in the print and broadcast media, the Sanctuary has reached Hawai'i's visitors and residents with messages intended to simultaneously promote humpback whale protection and foster sustainable ocean-based ecotourism. One exemplary activity - The Great Sanctuary Ocean Count, which annually trains more than 1000 volunteers to monitor humpback whales from shore-based observation stations throughout the state. The Sanctuary is also recognized locally and nationally for its Maui Visitor and Education Center, which hosts more than 5,000 visitors and 20 school groups annually.

■ **Environmental Review and Permitting** - The state Sanctuary office has offered otherwise unavailable technical expertise to the Department in reviewing proposed development projects and other proposed activities that might

have negative impacts on Hawai'i's precious ocean resources. For instance, through persistent input from the state Sanctuary office, the Navy agreed to not operate its controversial SURTASS Low Frequency Sonar System over Penguin Bank (an important fishing ground and whale breeding area). By strongly recommending an enhanced monitoring program be included as a CDUP condition, the Sanctuary was also instrumental in assuring minimal impact on marine mammals from the Department-authorized Acoustic Thermography of Ocean Climate (ATOC/NPAL) experiment conducted in waters off Kauai.

■ **Marine Mammal Conservation and Stranding Response** - The Sanctuary has been instrumental in providing rapid and humane responses to more than a dozen strandings of whales and dolphins along Hawai'i's shores. For example, the Sanctuary provided the vehicles, equipment and manpower needed to humanely euthanize and examine a rare beaked whale that stranded on Maui in 2001. The Sanctuary also provided overall coordination and funding for the removal and disposal of a 3-ton sperm whale carcass that washed up on the windward coast of Oahu.

NORTHWESTERN HAWAIIAN ISLANDS

PROGRAM OVERVIEW

On December 4, 2000, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Reserve) was created by Executive Order 13178. The Reserve encompasses an area of the marine waters and submerged lands of the Northwestern Hawaiian Islands extending approximately 1200 nautical miles long and 100 nautical miles wide. Executive Order 13178 contains conservation measures that restrict some fishing and other activities throughout the Reserve, and establish-

es Reserve preservation areas around certain islands, atolls and banks where all consumptive or extractive uses are prohibited. This Reserve does not include state waters. A process has begun to designate the reserve area as a National Marine Sanctuary. The state is one of several agencies involved in crafting the management plan for the area and state waters may be considered in a Sanctuary based on the final recommendations and determination by the Governor.

New State Rules

New proposed rules would limit entry into state waters within the NWHI except by permit, which would be issued only after a 30-day public comment period. Fishing would be limited to line gear only (such as trolling, hand-line and pole and line). The rules would prohibit setting foot on shore, and prohibit destroying corals (including by anchoring). In 2001, DLNR held five public hearings on the creation of this FMA then revised the proposed FMA based on public comments made. Further public hearings are planned in late 2002.

The DLNR has also been in negotiation with the U.S. Dept. of Commerce to sign a memorandum of agreement to provide resources to the State to assist DLNR in management of state waters and to support Commerce during the federal sanctuary designation process. Both parties signed this memorandum.

The 10 small islands (a total of 9 square kilometers) that comprise the Northwestern Hawaiian Islands (NWHI) covers 9,124 square kilometers and accounts for 69% of all the coral reefs under U.S. jurisdiction.

The islands and atolls support millions of nesting seabirds, and are the breeding grounds for the endangered Hawaiian monk seal, and the threatened green turtle. Coral reefs in the NWHI provide essential habitat for several commercially important fisheries, and countless indigenous and endemic reef species, many

of which have yet to be described and recorded. The islands and reefs have been impacted in recent decades from the accumulations of thousands of tons of derelict fishing gear. Ship groundings and fuel spills have damaged some reef habitats.

In September and October 2000, the U.S. Fish and Wildlife Service (USFWS), Hawai'i Department of Land and Natural Resources (DLNR), and NOAA's National Marine Fisheries Service (NMFS) and National Ocean Service (NOS), in partnership with the academic community, undertook a large-scale rapid ecological assessment (REA) of the coral reef resources of the entire NWHI. Three complete and independent assessment teams, based on two research ships (one of which is NOAA ship Townsend Cromwell), assessed the benthic and fish coral reef resources, mapped habitat complexity, and assessed impacts to the ecosystem at all of the major islets and atolls along the entire NWHI. The assessments will provide a baseline for long-term monitoring at strategic sites and to monitor changes in this diverse ecosystem. The interim report of survey results was issued in March 2002. It can be viewed online at:

<http://www.hawaii.edu/ssri/hcri/NOWRAMP> also at <http://www.hawaiireef.noaa.gov> A second expedition was planned for September and October 2002.

COMMERCIAL FISHERIES LANDINGS TEN YEAR TRENDS, 1992 – 2001, STATE OF HAWAII

PELAGIC FISHERIES: TUNAS, BILLFISHES AND OTHER PELAGIC SPECIES

The pelagic fisheries are primarily fished by longliners, aku boat pole & line fishers, tuna handliners, and trollers. During the early 1990s, the longline fishery flourished as the State experienced an expansion of this fleet

from fishing vessels migrating from both the East and Gulf coasts of the mainland U.S. These fishing vessels targeted the abundant broadbill swordfish stocks in the distant cold waters far north of the Hawaiian Islands. Longliners also target and land mid to large-size bigeye and yellowfin tunas and are rewarded with high ex-vessel prices. In the late 1990s, federal legal action effectively shut down the shallow longline gear sets for broadbill. This action was necessary to mitigate the interaction between longline fishing gear and endangered marine animals such as leather-back sea turtles. Longliners then began targeting bigeye and yellowfin tunas, although the federal court later imposed seasonal area closures south of the main Hawaiian Islands during April and May.

During the past few years, the near shore tuna handline fishery was very active as small fishing vessel fleets deployed 'home-made' fish aggregating devices (FAD) to hold the yellowfin tunas. These FADs are not maintained by the State and DLNR considers the deployment to be unlawful. The tuna handline fishery covering fishing areas in the Cross Seamount south of Hawaii and several National weather buoys continues to be actively fished with large landings of small to mid-size yellowfin and bigeye tuna.

The aku boat pole and line fishery is rapidly aging as the fleet made up of mostly wooden sampans are prone to costly repairs and are unable to leave port under less than ideal fishing



Tide pool picture provided by Clifford Inn, the SHPD.

conditions. Currently, the State has been operating with about a half dozen fishing vessels during the past decade. This fishery supplies the majority of the aku in the fresh fish market.

Landings for other pelagic species including mahimahi and ono were relatively stable, and are caught year round by small vessel troll fleets.

Benthic Fisheries: Bottomfishes and Jacks

There are two distinct bottomfish fisheries in the State. One is in the main Hawaiian Islands (MHI) and the second is located in the federally managed Northwestern Hawaiian Islands (NWHI). The fishery in the NWHI is basically sound with fishing pressure exerted only by a relatively small fleet of commercial fishing vessels. According to fishing stock assessments from the Federal Bottomfish Plan Monitoring Team, the bottomfish resources appear to be healthy with sufficient spawning stock biomass available to sustain the fishery. The NWHI landings peaked around the mid 1990s and dipped toward the end because of attrition among the Federal Permit holders, and a limited entry management plan was implemented for the Mau Zone. By contrast, the MHI bottomfish resource receives heavy fishing pressure from many commercial and non-commercial fishers. The prized red snappers including ehu and onaga especially have been heavily fished to the point where the resources are considered to be in critically depleted conditions. A State management plan was implemented in June 1998 to manage the bottomfish resources (seven species) by closing 19 designated fishing areas, requiring vessel registration, non-commercial bag limit for ehu and onaga, and restricting fishing methods. MHI bottomfish landings attain higher ex-vessel prices than NWHI because the fish sizes are smaller and in fresher condition.

The jacks (*Carangoides spp.*) are primarily in

nearshore and benthic habitats. In the MHI, jacks appear to be a resource that is stressed by both commercial and non-commercial fishing activities. The level of commercial landings gradually dipped during the past decade. Generally, jacks are not targeted by fishers for commercial purposes, and the markets are very selective about purchasing certain species due to ciguatera toxicity. The jacks are a highly desirable gamefish for non-commercial fishers. Most of the jacks landed by commercial NWHI bottomfishers are by-catches but are important for landing purposes because some of the species are included in the Federal Bottomfish Management Fishery Plan and are used to determine minimum fishing quotas to renew bottomfish fishing permits.

Coastal Pelagic Fisheries: Akule and Opelu
The landing trends for akule appear to be rising and remain level for opelu. Both species are considered to be healthy resources and historical landing trends, overall, tend to be cyclical. Although fishing method conflicts exist between large net operations and small vessel handliners, there are other non-fishing effort factors that affect the akule resources, including rainfall and changes in habitats. The majority of the commercial akule landings are caught by net. Akule landed by handline yields higher ex-vessel prices than net landings.

Crustacean Fisheries: Lobster and Deep Water Shrimp

During the past decade, the majority of the spiny and slipper lobster landings were from the Federal Northwestern Hawaiian Islands lobster trap fishery. This fishery was recently closed by the Western Pacific Regional Management Fishery Council. The lobster resources in the main Hawaiian Islands are stressed due to heavy fishing pressure by net, trap and dive activities.

Deep water shrimps (*Heterocarpus spp.*) are

FIGURE 15.

COMMERCIAL MARINE LICENSING SYSTEM*License Summary Between 07/01/1999 and 06/30/2000*

TYPE	HAWAII	MAUI	KAUAI	OAHU	MOLOKAI	STATEWIDE
RESIDENT						
Number	679	358	263	2,447	54	3,801
Amount	26,875	15,050	10,975	112,925	1,975	167,800
NON-RESIDENT						
Number	13	0	1	82	0	96
Amount	2,150	0	200	14,150	0	16,500
SPEC. MARINE PROD.						
Number	28	6	0	155	0	189
Amount	1,125	160	0	2,488	0	3,773
COMMERCIAL BAIT						
Number	1	6	3	20	5	35
Amount	1	6	52	706	103	868
NWHI						
Number	0	0	2	6	0	8
Amount	0	0	100	202	0	302
TOTAL						
Number	721	370	269	2,710	59	4,129
Amount	30,151	15,216	11,327	130,471	2,078	189,243

FIGURE 16.

The charts below reflect information gathered for the FY 1999.

SEA LANDINGS BY ISLAND FY 1999

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Oahu	22,173,859	21,671,083	46,746,290
Hawaii	3,610,844	3,364,900	5,938,550
Maui	677,745	516,495	1,409,764
Kauai & Niihau	796,032	686,258	1,458,022
Molokai	43,561	38,403	149,503
Lanai	21,316	14,932	31,300
TOTAL	27,323,357	26,292,071	55,733,429

POND LANDINGS BY ISLAND

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Omitted due to confidentiality			

TOTAL LANDINGS BY ISLAND

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Oahu ²	22,173,859	21,671,083	46,746,290
Hawaii ²	3,610,844	3,364,900	5,938,550
Maui	677,745	516,495	1,409,764
Kauai & Niihau	796,032	686,258	1,458,022
Molokai	43,561	38,403	149,503
Lanai	21,316	14,932	31,300
TOTAL	27,323,357	26,292,071	55,733,429

FIGURE 17.

The charts located below contain information gathered for the FY 2000.

SEA LANDINGS BY ISLAND FY 2000

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Oahu	21,995,184	21,630,577	51,870,367
Hawaii	3,903,622	3,698,697	6,854,835
Maui	582,711	456,076	1,378,037
Kauai & Niihau	865,863	757,420	1,820,627
Molokai	48,407	36,983	124,906
Lanai	17,956	12,921	31,461
TOTAL	27,413,743	26,592,674	62,080,234

POND LANDINGS BY ISLAND

Omitted due to confidentiality

TOTAL LANDINGS BY ISLAND

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Oahu	21,995,184	21,630,577	51,870,367
Hawaii	3,903,622	3,698,697	6,854,835
Maui	582,711	456,076	1,378,037
Kauai & Niihau	865,863	757,420	1,820,627
Molokai	48,407	36,983	124,906
Lanai	17,956	12,921	31,461
TOTAL	27,413,743	26,592,674	62,080,234

FIGURE 18.

The charts on the left contain information gathered for the FY 2001.

SEA LANDINGS BY ISLAND, FY 2001

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Oahu	16,871,358	16,539,642	37,000,385
Hawaii	2,947,706	2,738,588	5,462,457
Maui	523,694	391,975	1,195,261
Kauai & Niihau	718,920	606,314	1,584,634
Molokai	32,669	26,339	108,325
Lanai	17,186	13,452	32,803
TOTAL	21,111,533	20,316,310	45,383,865

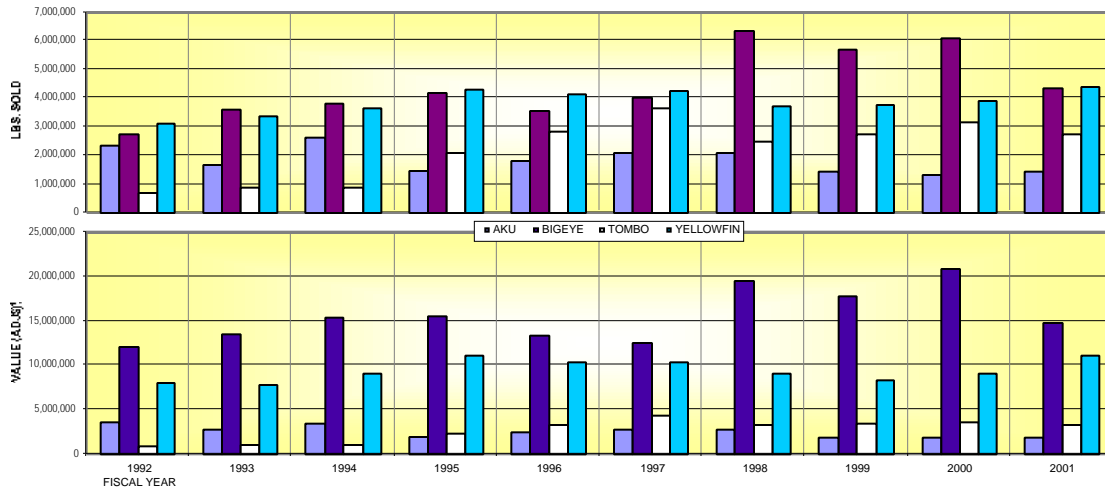
POND LANDINGS BY ISLAND

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Oahu ²	---	---	---
Hawaii ²	---	---	---
Maui	---	---	---
Kauai & Niihau	---	---	---
Molokai	---	---	---
Lanai	---	---	---
TOTAL²	6,427	6,422	13,040

TOTAL LANDINGS BY ISLAND

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Oahu	16,871,358	16,539,642	37,000,385
Hawaii	2,947,706	2,738,588	5,462,457
Maui	523,694	391,975	1,195,261
Kauai & Niihau	718,920	606,314	1,584,634
Molokai	32,669	26,339	108,325
Lanai	17,186	13,452	32,803
TOTAL	21,117,960	20,322,732	45,396,905

FIGURE 19.

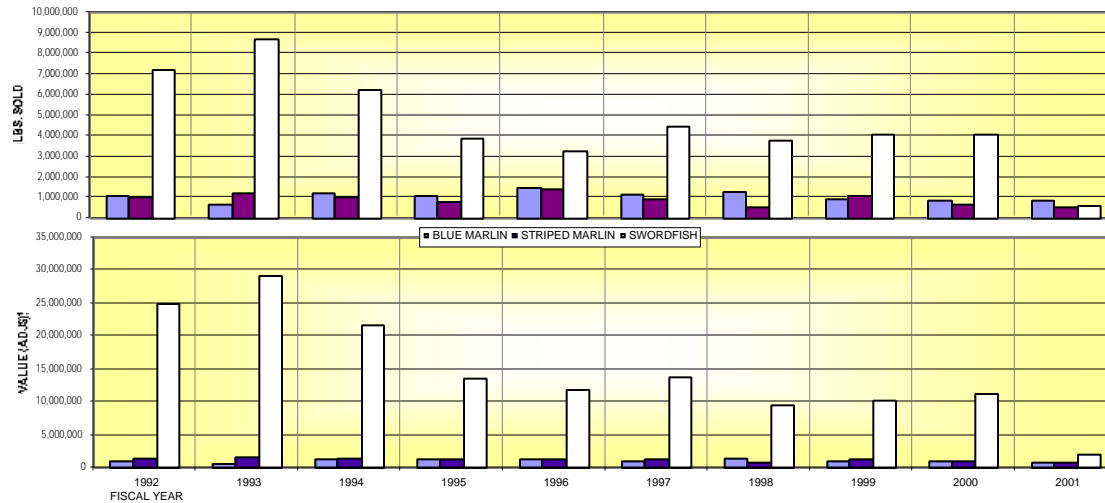
SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"TUNAS"

SPECIES	FISCAL YEAR										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
AKU	Lbs. Sold	2,344,694	1,665,596	2,659,259	1,474,441	1,796,739	2,112,597	2,107,129	1,433,223	1,341,133	1,443,400
	Value (Adj.\$) ¹	3,647,515	2,764,039	3,515,320	2,083,819	2,549,159	2,828,851	2,757,405	1,835,905	1,874,914	1,830,580
BIGEYE	Lbs. Sold	2,741,154	3,634,793	3,805,400	4,188,099	3,592,181	4,003,073	6,372,575	5,726,670	6,138,812	4,338,290
	Value (Adj.\$) ¹	12,150,563	13,463,632	15,424,903	15,620,629	13,340,363	12,546,938	19,545,721	17,716,328	20,930,669	14,808,759
TOMBO	Lbs. Sold	692,886	874,670	868,079	2,126,552	2,825,533	3,652,098	2,489,388	2,723,032	3,175,951	2,760,680
	Value (Adj.\$) ¹	954,072	1,110,881	1,060,616	2,369,342	3,306,304	4,346,731	3,251,403	3,497,991	3,672,805	3,320,280
YELLOWFIN	Lbs. Sold	3,124,138	3,357,816	3,673,615	4,298,933	4,183,358	4,267,745	3,711,422	3,765,721	3,919,639	4,389,170
	Value (Adj.\$) ¹	8,010,274	7,836,509	9,196,810	11,114,104	10,377,162	10,432,060	9,130,876	8,317,422	9,144,478	11,199,187
TOTAL	Lbs. Sold	8,902,872	9,532,875	11,006,353	12,088,025	12,397,811	14,035,513	14,680,514	13,648,646	14,575,535	12,931,571
	Value (Adj.\$) ¹	24,762,414	25,175,061	29,197,649	31,187,894	29,572,988	30,154,581	34,685,404	31,367,647	35,622,855	31,148,806

¹Honolulu Consumer Price Index (all wage earners)

1

FIGURE 20.

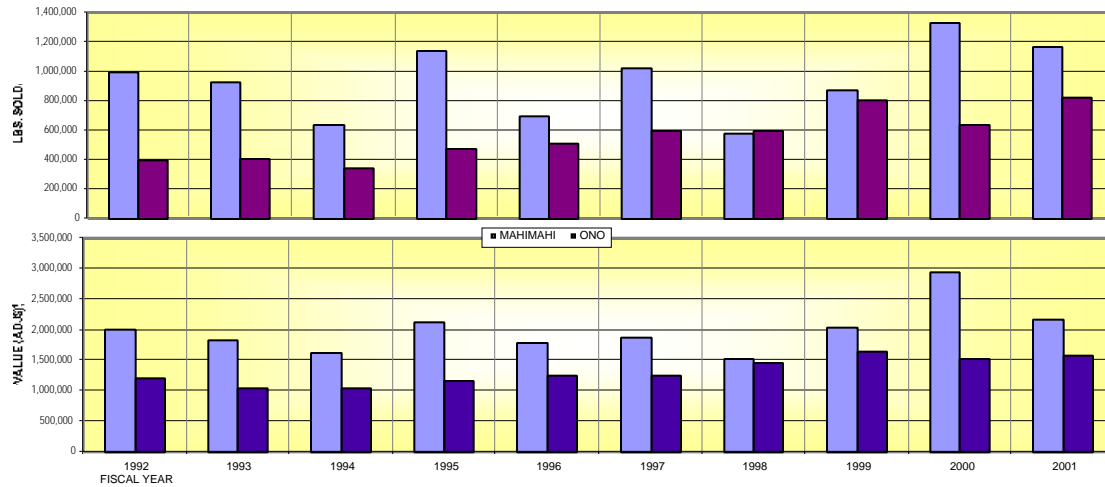
SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"BILLFISH"

SPECIES		FISCAL YEAR									
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
BLUE MARLIN	Lbs. Sold	1,117,203	660,044	1,249,737	1,093,670	1,520,486	1,165,313	1,292,113	972,428	907,859	866,080
	Value (Adj.\$) ¹	1,161,512	714,561	1,297,864	1,174,047	1,340,130	1,162,085	1,404,007	1,071,465	1,030,049	951,740
STRIPED MARLIN	Lbs. Sold	1,004,837	1,238,862	998,819	829,373	1,414,796	967,743	549,573	1,108,175	687,975	534,310
	Value (Adj.\$) ¹	1,515,272	1,638,109	1,408,556	1,200,579	1,340,273	1,298,164	926,092	1,273,497	1,122,361	785,830
SWORDFISH	Lbs. Sold	7,224,162	8,704,286	6,272,108	3,882,041	3,275,650	4,460,832	3,812,774	4,093,515	4,100,703	632,460
	Value (Adj.\$) ¹	24,974,196	29,229,275	21,710,142	13,634,967	11,909,251	13,811,691	9,514,182	10,322,188	11,261,902	2,080,730
TOTAL	Lbs. Sold	9,346,202	10,603,192	8,520,664	5,805,084	6,210,932	6,593,888	5,654,460	6,174,118	5,696,537	2,032,860
	Value (Adj.\$) ¹	27,650,980	31,581,946	24,416,562	16,009,593	14,589,653	16,271,940	11,844,281	12,667,151	13,414,312	3,818,310

¹Honolulu Consumer Price Index (all wage earners)

2

FIGURE 21.

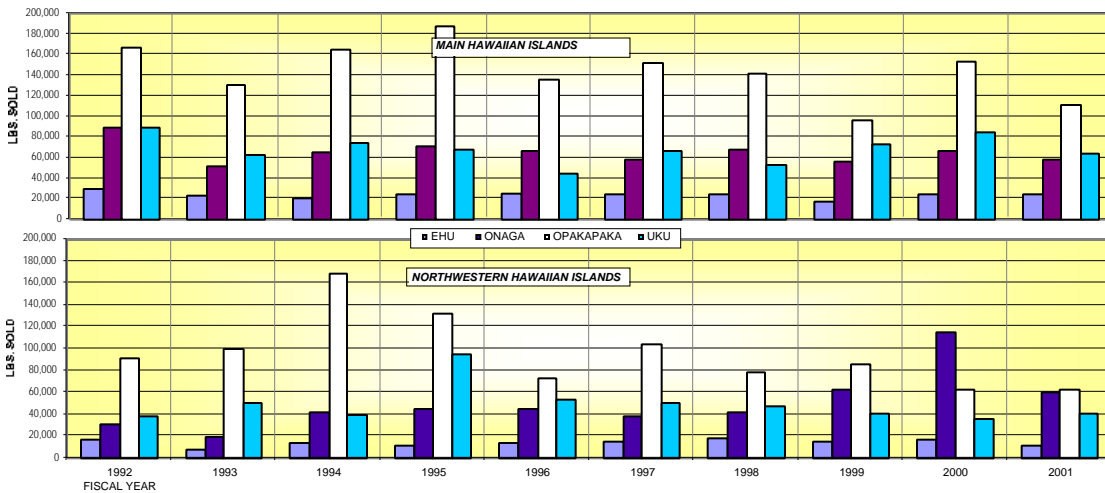
SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"MISCELLANEOUS PELAGICS"

SPECIES		FISCAL YEAR									
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
MAHIMAH	Lbs. Sold	995,262	932,843	640,513	1,139,284	696,745	1,024,448	576,581	879,045	1,332,530	1,170,411
	Value (Adj\$) ¹	2,023,883	1,837,220	1,625,116	2,126,093	1,794,540	1,870,534	1,531,540	2,046,088	2,955,057	2,183,941
ONO	Lbs. Sold	396,907	405,226	341,303	476,298	513,130	599,161	604,258	805,328	635,012	825,881
	Value (Adj\$) ¹	1,211,312	1,061,037	1,044,211	1,156,340	1,267,870	1,265,151	1,455,770	1,643,283	1,541,526	1,585,911
TOTAL	Lbs. Sold	1,392,169	1,338,069	981,816	1,615,582	1,209,875	1,623,609	1,180,839	1,684,373	1,967,542	1,996,301
	Value (Adj\$) ¹	3,235,195	2,898,257	2,669,326	3,282,433	3,062,411	3,135,685	2,987,310	3,689,370	4,496,583	3,769,852

¹Honolulu Consumer Price Index (all wage earners)

3

FIGURE 22.

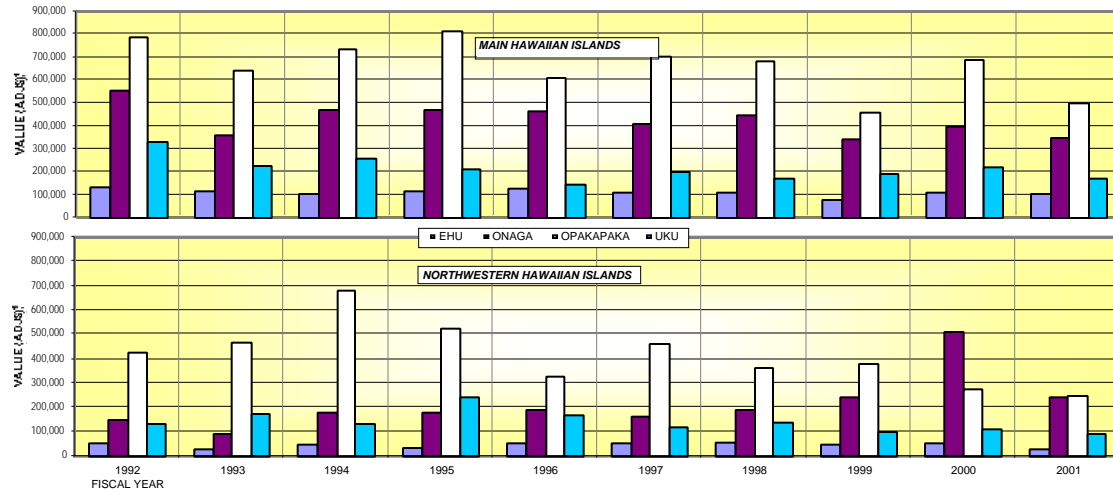
SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"DEEP BOTTOM FISHES"

SPECIES	AREA	FISCAL YEAR									
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EHU	MHI (LBS. SOLD)	29,587	22,525	20,983	24,404	26,340	24,097	24,127	17,253	24,322	23,901
	NWHI (LBS. SOLD)	16,785	7,077	14,100	11,466	14,332	15,910	17,683	15,368	16,964	11,121
ONAGA	MHI (LBS. SOLD)	89,668	52,380	65,516	70,756	67,033	58,800	67,796	55,654	66,773	58,941
	NWHI (LBS. SOLD)	30,797	19,490	42,181	44,382	45,097	38,051	42,930	63,089	115,767	59,621
OPAKAPAKA	MHI (LBS. SOLD)	166,800	130,546	163,948	187,328	136,110	152,773	142,022	97,105	153,826	111,571
	NWHI (LBS. SOLD)	91,308	99,426	168,695	132,221	73,314	104,061	77,837	86,049	62,579	62,721
UKU	MHI (LBS. SOLD)	90,153	61,961	74,810	68,502	45,301	66,035	53,425	73,104	84,306	64,506
	NWHI (LBS. SOLD)	38,908	49,812	39,988	94,463	54,424	50,575	46,833	41,295	36,025	41,116
TOTAL	MHI (LBS. SOLD)	376,208	267,412	325,267	350,990	274,784	301,705	287,370	243,116	329,227	256,931
	NWHI (LBS. SOLD)	177,798	175,805	264,964	282,532	187,167	206,597	185,283	205,801	231,335	174,641

¹Honolulu Consumer Price Index (all wage earners)

4

FIGURE 23.

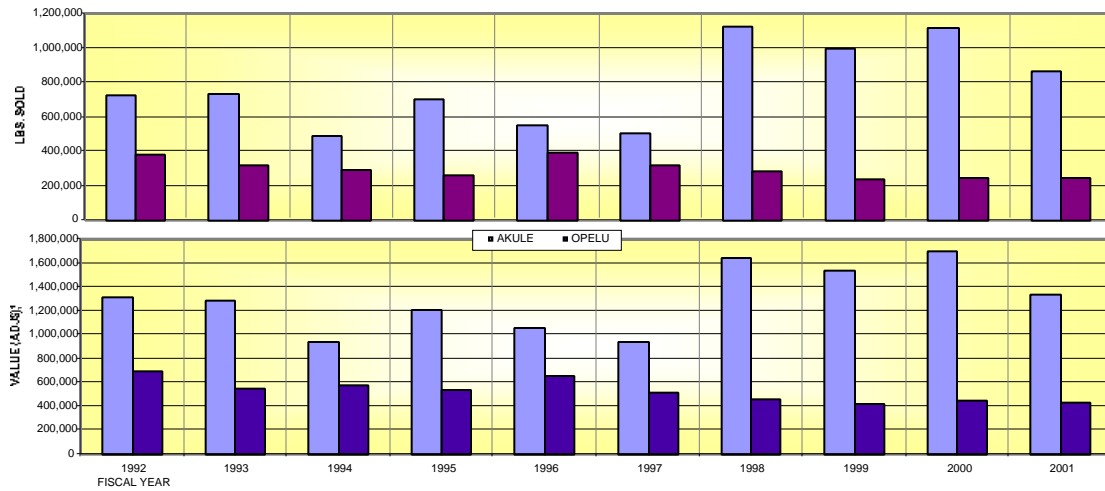
SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"DEEP BOTTOM FISHES"

SPECIES	AREA	FISCAL YEAR									
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
EHU	MHI (Value-Adj)\$ ¹	133,160	114,424	104,217	117,247	129,942	108,732	107,249	76,649	109,623	104,52
	NWHI (Value-Adj)\$ ¹	49,880	27,038	48,175	35,060	50,865	52,610	55,685	44,993	50,640	31,22
ONAGA	MHI (Value-Adj)\$ ¹	554,594	358,658	468,607	471,394	463,225	409,855	447,012	342,420	398,299	350,57
	NWHI (Value-Adj)\$ ¹	149,505	90,154	176,203	179,738	187,868	163,409	189,930	244,678	515,725	241,02
OPAKAPAKA	MHI (Value-Adj)\$ ¹	787,038	640,083	735,505	814,580	611,625	707,136	686,595	456,805	691,835	499,76
	NWHI (Value-Adj)\$ ¹	427,497	470,120	680,550	524,795	330,740	458,692	365,146	382,726	278,436	247,97
UKU	MHI (Value-Adj)\$ ¹	333,119	229,472	259,882	213,315	146,415	204,640	173,590	190,581	221,406	173,51
	NWHI (Value-Adj)\$ ¹	130,848	174,102	134,441	244,111	168,335	120,725	140,078	99,709	106,880	94,66
TOTAL	MHI (Value-Adj)\$ ¹	1,807,911	1,342,636	1,568,210	1,616,537	1,351,208	1,430,363	1,414,445	1,066,455	1,421,163	1,128,37
	NWHI (Value-Adj)\$ ¹	757,730	761,413	1,039,368	983,705	737,808	795,436	750,838	772,106	951,682	614,88

¹Honolulu Consumer Price Index (all wage earners)

5

FIGURE 24.

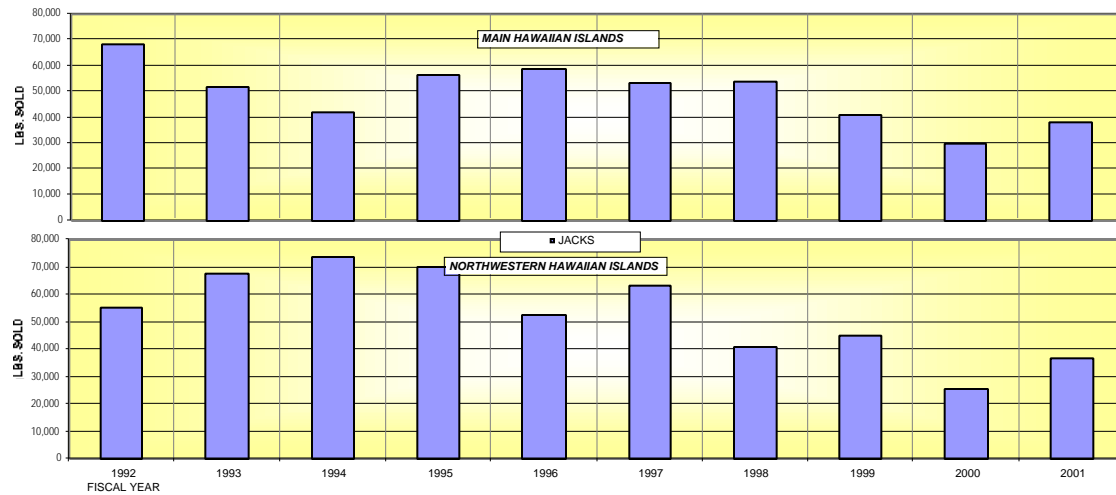
SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"COASTAL PELAGIC"

SPECIES		FISCAL YEAR									
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
AKULE	Lbs. Sold	723,719	738,164	490,247	700,624	555,317	504,766	1,129,812	996,432	1,120,664	866,42
	Value (Adj.\$) ¹	1,316,422	1,291,426	936,077	1,211,335	1,055,333	939,004	1,649,200	1,540,554	1,705,980	1,336,92
OPELU	Lbs. Sold	386,316	316,760	297,258	264,684	393,858	321,241	281,820	234,913	245,483	245,75
	Value (Adj.\$) ¹	697,554	549,764	571,312	539,844	656,943	515,066	462,585	424,950	448,906	439,54
TOTAL	Lbs. Sold	1,110,035	1,054,924	787,505	965,308	949,175	826,007	1,411,632	1,231,345	1,366,147	1,112,18
	Value (Adj.\$) ¹	2,013,976	1,841,189	1,507,388	1,751,179	1,712,276	1,454,070	2,111,786	1,965,504	2,154,886	1,776,47

¹Honolulu Consumer Price Index (all wage earners)

6

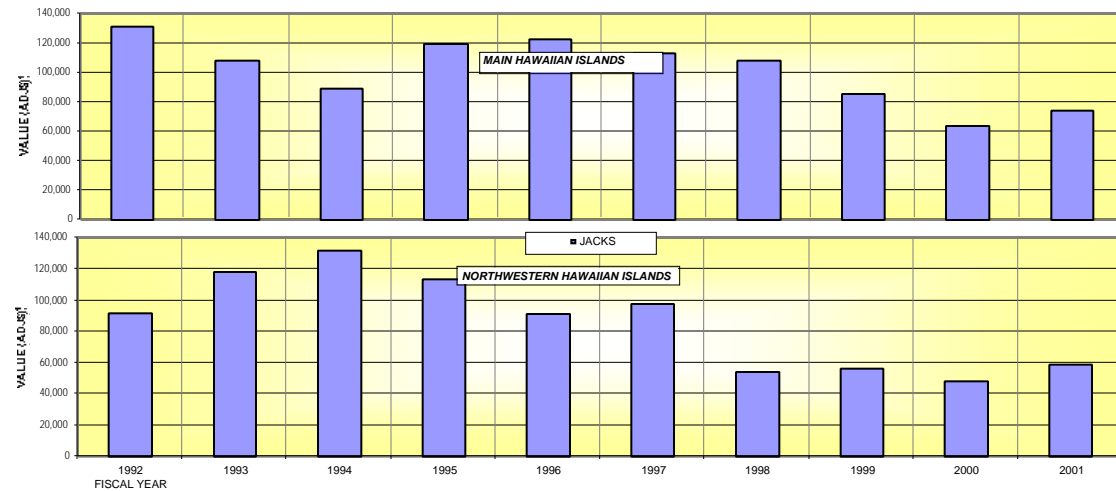
FIGURE 25.

SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"JACKS"

¹Honolulu Consumer Price Index (all wage earners)

7

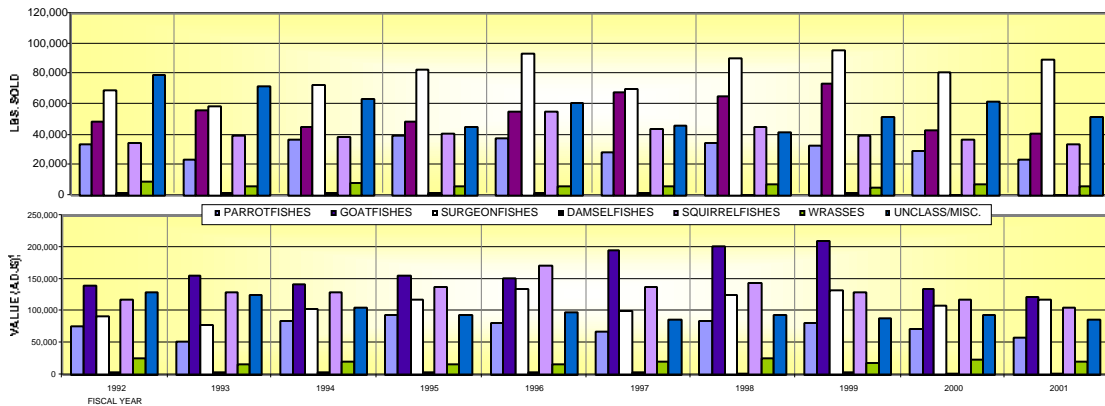
FIGURE 26.

SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"JACKS"

¹Honolulu Consumer Price Index (all wage earners)

8

FIGURE 27.

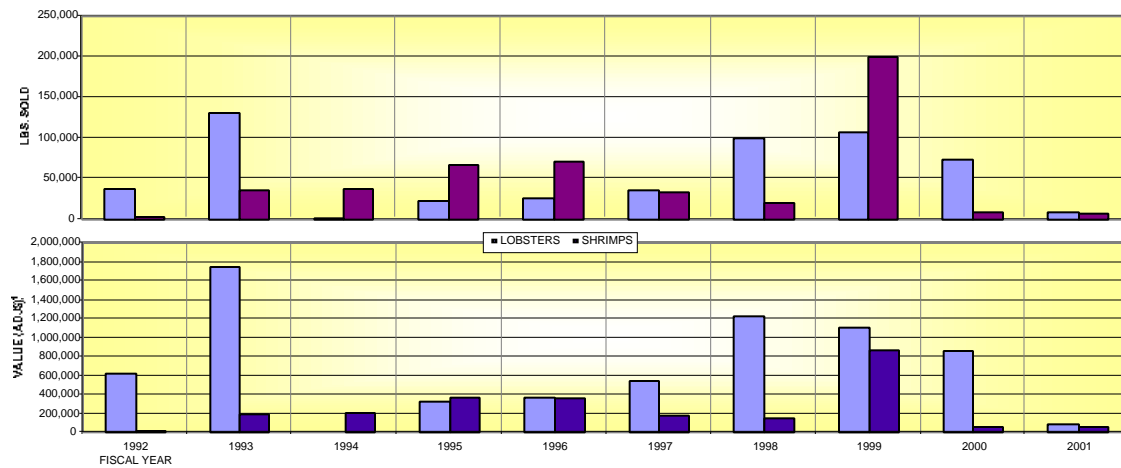
SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"INSHORE-FIN FISHES"

		FISCAL YEAR									
SPECIES		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
PARROTFISHES	Lbs. Sold	34,413	24,318	37,280	39,648	37,439	28,596	35,147	33,563	29,549	24,43
	Value (Adj.\$) ¹	75,983	53,339	84,483	93,589	81,300	68,506	84,512	80,066	73,267	59,01
GOATFISHES	Lbs. Sold	48,910	56,272	45,096	49,293	55,785	68,762	65,356	73,535	43,687	40,54
	Value (Adj.\$) ¹	140,212	155,299	141,586	156,594	152,362	195,336	202,456	211,033	135,330	122,05
SURGEONFISHES	Lbs. Sold	69,020	58,986	72,958	83,377	92,839	70,441	90,810	96,166	81,435	89,94
	Value (Adj.\$) ¹	91,627	79,454	102,459	118,999	135,009	100,154	124,986	132,690	110,686	118,53
DAMSELFISHES	Lbs. Sold	1,885	1,981	1,730	1,734	2,243	2,157	1,025	1,797	967	713
	Value (Adj.\$) ¹	3,931	3,585	3,421	3,401	4,587	3,969	1,980	3,486	1,922	1,28
SQUIRRELFISHES	Lbs. Sold	35,231	39,313	38,598	40,952	55,500	44,672	45,509	39,904	37,018	34,15
	Value (Adj.\$) ¹	118,182	128,342	129,166	138,698	170,498	137,639	145,721	128,619	119,358	106,35
WRASSES	Lbs. Sold	9,216	6,803	8,540	6,041	6,427	6,262	7,322	5,597	6,990	6,08
	Value (Adj.\$) ¹	26,429	16,624	21,673	17,053	18,092	22,685	25,989	20,091	25,178	23,02
UNCLASS.MISC.	Lbs. Sold	79,738	72,117	63,912	44,996	60,713	45,897	41,825	51,457	61,785	51,40
	Value (Adj.\$) ¹	128,403	123,976	106,130	93,541	99,723	88,607	95,188	89,262	94,505	88,38
TOTAL	Lbs. Sold	278,413	259,790	268,114	266,041	310,946	266,787	286,994	302,019	261,431	247,28
	Value (Adj.\$) ¹	584,768	560,618	588,918	621,875	661,572	616,898	680,832	665,247	560,246	518,65

¹Honolulu Consumer Price Index (all wage earners)

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FIGURE 28.

SEA LANDINGS BY SPECIES GROUP FISCAL YEAR 1992 - 2001
"CRUSTACEANS"

		FISCAL YEAR									
SPECIES		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
LOBSTERS	Lbs. Sold	38,617	131,059	867	22,808	26,183	35,533	100,546	107,014	73,593	7,76
	Value (Adj.\$) ¹	628,652	1,746,022	6,170	333,086	371,907	551,323	1,232,191	1,117,550	864,545	89,98
SHRIMPS	Lbs. Sold	3,603	35,631	38,488	67,184	70,227	33,414	20,496	200,301	7,916	6,39
	Value (Adj.\$) ¹	14,713	189,144	214,797	373,004	359,820	179,379	147,340	874,141	54,046	53,26
TOTAL	Lbs. Sold	42,220	166,690	39,355	89,992	96,410	68,947	121,042	307,315	81,509	14,15
	Value (Adj.\$) ¹	643,364	1,935,166	220,967	706,090	731,727	730,702	1,379,531	1,991,691	918,591	143,24

¹Honolulu Consumer Price Index (all wage earners)

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FIGURE 29.

BY FISHING METHODS, Fiscals 1997 - 2001

Fiscal Year	Fishing Method	Pounds Caught	Pounds Sold	Value
1997	Longline	16,740,793	16,684,780	38,025,316
	Trolling	2,972,001	2,504,673	4,437,844
	Tuna Handline	2,564,110	2,520,175	4,560,707
	Aku Boat	1,665,220	1,653,545	2,139,820
	Deepbottom & Inshore Handline	1,294,448	1,196,387	3,625,043
	Net	683,248	626,466	1,055,530
	Other	324,040	304,016	1,251,886
	TOTAL	26,243,860	25,490,042	\$55,096,146
1998	Longline	16,147,761	15,963,726	37,686,212
	Trolling	2,709,331	2,291,262	4,444,595
	Tuna Handline	2,446,304	2,383,933	4,471,534
	Aku Boat	1,707,795	1,703,358	2,138,854
	Net	1,387,647	1,259,141	1,784,750
	Deepbottom & Inshore Handline	1,220,669	1,110,410	3,430,371
	Other	627,422	605,321	1,988,178
	TOTAL	26,246,929	25,317,151	\$55,944,494
1999	Longline	17,791,739	17,673,684	38,421,703
	Trolling	2,838,486	2,329,379	4,386,459
	Tuna Handline	2,579,662	2,493,973	4,328,511
	Net	1,207,609	1,102,186	1,671,499
	Deepbottom & Inshore Handline	1,151,977	1,053,718	3,033,957
	Aku Boat	1,057,817	1,054,768	1,283,866
	Other	650,773	539,159	2,554,996
	TOTAL	27,278,063	26,246,867	\$55,680,990
2000	Longline	17,468,741	17,400,020	43,062,089
	Tuna Handline	3,344,433	3,261,855	6,055,994
	Trolling	2,789,079	2,354,578	4,819,556
	Net	1,276,415	1,180,973	1,760,027
	Deepbottom & Inshore Handline	1,233,089	1,122,488	3,600,642
	Aku Boat	1,019,507	1,018,649	1,417,696
	Other	280,748	252,181	1,365,752
	TOTAL	27,412,012	26,590,744	\$62,081,757
2001	Longline	12,672,461	12,652,478	\$29,792,662
	Trolling	2,776,011	2,284,617	\$4,666,783
	Tuna Handline	2,392,638	2,331,305	\$4,592,753
	Net	1,052,841	963,988	\$1,461,151
	Deepbottom & Inshore Handline	1,040,170	946,181	\$2,860,744
	Aku Boat	978,315	965,691	\$1,408,438
	Other	179,842	154,423	\$540,093
	TOTAL	21,092,278	20,298,683	\$45,322,624

FIGURE 30. SWORDFISH & TUNA CATCHES, Fiscals 1997 - 2001

Fiscal Year	Species	Pounds Caught	Pounds Sold	Value
1997	Swordfish	4,473,675	4,444,631	\$13,239,825
	Bigeye tuna	3,762,589	3,756,351	\$11,658,770
	Yellowfin tuna	1,996,001	1,993,579	\$5,238,143
	Albacore	3,160,476	3,156,637	\$3,720,138
	TOTAL	13,392,741	13,351,198	\$33,856,876
1998	Swordfish	3,808,936	3,800,020	\$9,086,766
	Bigeye tuna	6,032,056	5,968,465	\$18,162,376
	Yellowfin tuna	1,603,050	1,597,328	\$4,121,496
	Albacore	1,890,351	1,851,387	\$2,490,928
	TOTAL	13,334,393	13,217,200	\$33,861,566
1999	Swordfish	4,078,505	4,077,203	\$9,955,562
	Bigeye tuna	5,412,596	5,394,020	\$16,616,996
	Yellowfin tuna	1,414,397	1,408,533	\$3,519,953
	Albacore	2,380,195	2,370,708	\$3,007,014
	TOTAL	13,285,693	13,250,464	\$33,099,525
2000	Swordfish	4,092,848	4,082,546	\$11,053,174
	Bigeye tuna	5,829,205	5,820,369	\$20,038,253
	Yellowfin tuna	1,146,694	1,144,578	\$3,024,402
	Albacore	2,586,411	2,584,755	\$3,087,912
	TOTAL	13,655,158	13,632,248	\$37,203,741
2001	Swordfish	615,695	615,695	\$2,035,007
	Bigeye tuna	3,865,317	3,859,114	\$13,967,472
	Yellowfin tuna	2,275,496	2,275,315	\$6,403,005
	Albacore	2,528,894	2,520,387	\$3,020,049
	TOTAL	9,285,402	9,270,511	\$25,425,533

FIGURE 31.

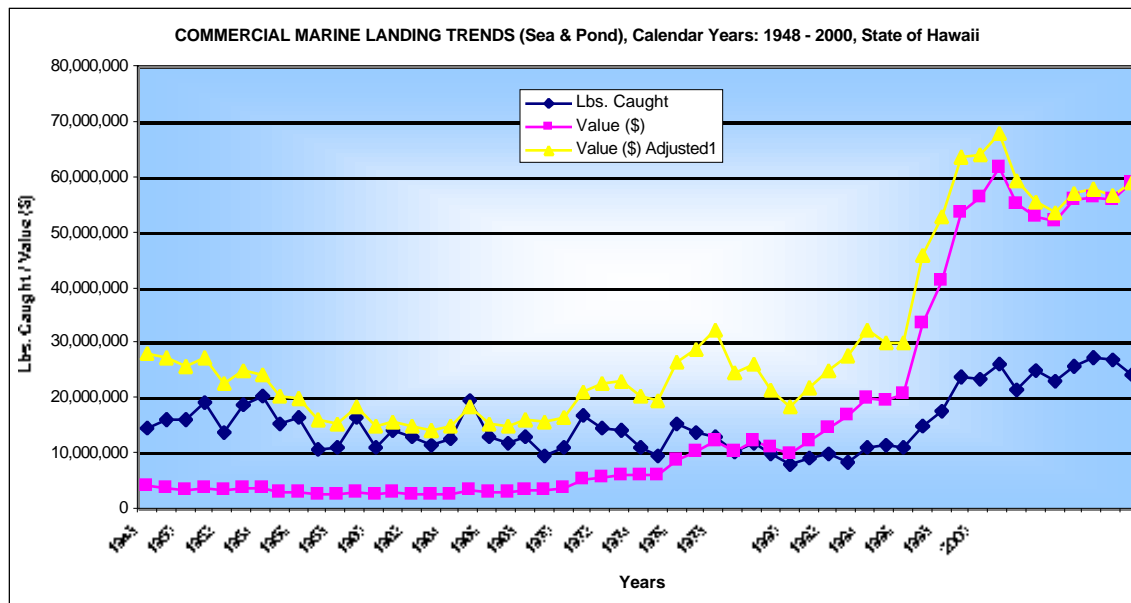
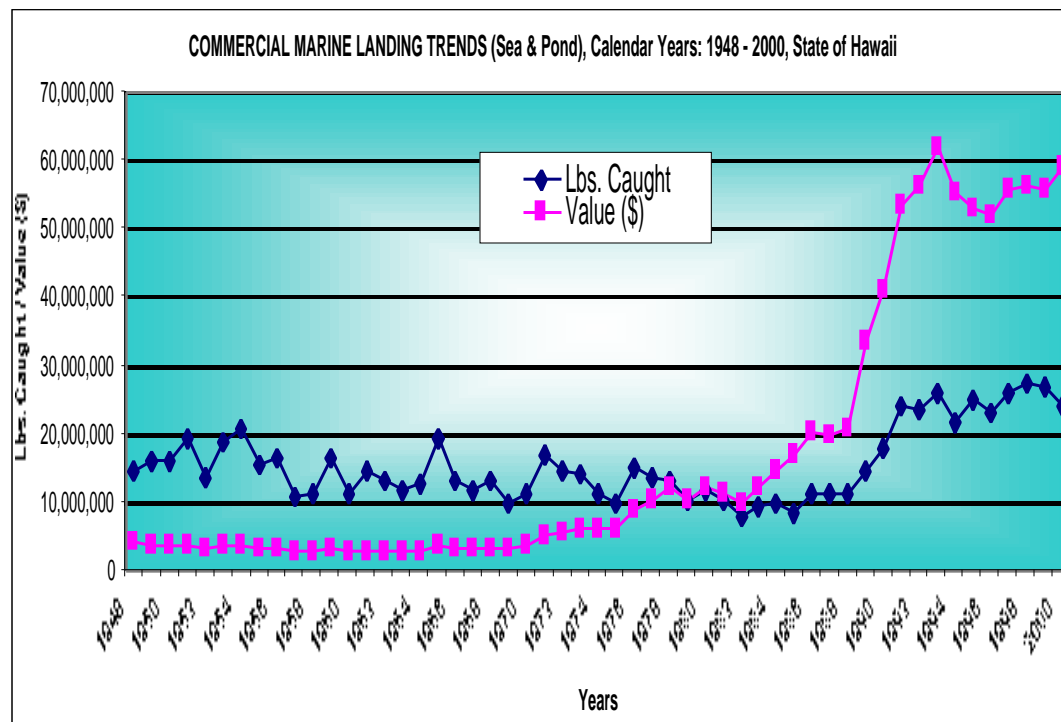


FIGURE 32.



Year	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Lbs. Caught	14,746,849	16,223,104	16,217,546	19,420,025	13,916,289	18,862,405	20,609,620	15,457,444	16,559,752	10,727,579	11,360,567	16,580,209	11,136,021
Value (\$)	4,117,327	3,944,543	3,556,322	3,998,499	3,449,424	3,797,840	3,708,550	3,164,742	3,174,657	2,604,469	2,632,169	3,179,050	2,705,151
Year	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Lbs. Caught	14,450,334	13,169,717	11,756,645	12,702,696	19,601,705	13,037,479	11,859,144	13,014,062	9,728,134	11,302,352	17,176,410	14,768,289	14,400,131
Value (\$)	2,903,181	2,819,331	2,682,049	2,849,371	3,603,056	3,128,537	3,076,180	3,449,622	3,501,209	3,902,110	5,241,951	5,747,103	6,115,899
Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Lbs. Caught	11,351,080	9,745,759	15,292,052	13,803,501	13,304,300	10,548,249	11,835,754	10,200,819	7,956,119	9,240,507	10,031,271	8,550,832	11,201,741
Value (\$)	6,020,672	6,308,192	8,876,942	10,282,943	12,247,291	10,501,177	12,386,810	11,292,909	10,139,671	12,510,723	14,827,867	16,957,549	20,154,771
Year	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lbs. Caught	11,473,241	11,155,369	14,885,821	17,956,497	23,938,952	23,483,812	26,180,946	21,833,002	24,978,286	23,130,510	25,937,240	27,453,149	27,058,221
Value (\$)	19,750,673	20,846,528	33,538,090	41,381,644	53,573,309	56,372,318	61,868,244	55,361,691	52,998,593	52,015,101	55,900,311	56,315,960	55,936,181
Year	2000												
Lbs. Caught	24,196,581												
Value (\$)	59,245,932												

FIGURE 33.

Year	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Lbs. Caught	-	-	-	-	-	-	-	-	14,746,840	16,223,104
Value (\$)	-	-	-	-	-	-	-	-	4,117,327	3,944,545
HCPI ¹	-	-	-	-	-	-	-	-	25.7	25.2
Value (\$) Adjusted ¹	-	-	-	-	-	-	-	-	28,244,543	27,596,162
Year	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Lbs. Caught	16,217,546	19,420,025	13,916,289	18,862,405	20,609,620	15,457,444	16,559,752	10,727,579	11,360,567	16,580,209
Value (\$)	3,556,322	3,998,499	3,449,424	3,797,840	3,708,550	3,164,742	3,174,657	2,604,469	2,632,169	3,179,050
HCPI ¹	24.3	25.7	26.5	26.7	26.9	27.3	27.7	28.6	30.0	30.5
Value (\$) Adjusted ¹	25,801,628	27,429,392	22,948,432	25,077,123	24,305,478	20,437,510	20,205,488	16,054,821	15,468,380	18,375,951
Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Lbs. Caught	11,136,020	14,450,334	13,169,717	11,756,645	12,702,696	19,601,705	13,037,479	11,859,144	13,014,062	9,728,134
Value (\$)	2,705,152	2,903,181	2,819,331	2,682,049	2,849,371	3,603,056	3,128,537	3,076,180	3,449,622	3,501,209
HCPI ¹	31.3	32.1	32.8	33.5	33.7	34.4	35.3	36.3	37.7	39.4
Value (\$) Adjusted ¹	15,237,006	15,944,885	15,153,904	14,114,783	14,906,353	18,465,662	15,624,960	14,940,235	16,131,787	15,666,577
Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Lbs. Caught	11,302,352	17,176,410	14,768,289	14,400,131	11,351,080	9,745,759	15,292,052	13,803,501	13,304,300	10,548,248
Value (\$)	3,902,110	5,241,951	5,747,103	6,115,894	6,020,672	6,308,192	8,876,942	10,262,943	12,247,291	10,501,177
HCPI ¹	41.5	43.2	44.6	46.6	51.5	56.3	59.1	62.1	66.9	74.3
Value (\$) Adjusted ¹	16,576,915	21,392,499	22,717,808	23,138,028	20,610,572	19,753,717	26,480,624	29,136,181	32,274,999	24,917,328
Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Lbs. Caught	11,835,754	10,200,819	7,956,119	9,240,507	10,031,271	8,550,832	11,201,742	11,473,241	11,155,369	14,885,821
Value (\$)	12,386,810	11,292,909	10,139,671	12,510,723	14,827,867	16,957,548	20,154,770	19,750,673	20,846,528	33,538,090
HCPI ¹	83.0	91.7	97.2	99.3	103.5	106.8	109.4	114.9	121.7	128.7
Value (\$) Adjusted ¹	26,310,778	21,711,449	18,391,193	22,211,888	25,257,516	27,992,656	32,479,762	30,304,993	30,199,202	45,942,232
Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Lbs. Caught	17,956,497	23,938,952	23,483,812	26,180,946	21,833,002	24,978,286	23,130,510	25,937,240	27,453,149	27,058,229
Value (\$)	41,381,644	53,573,309	56,372,318	61,868,244	55,361,691	52,998,593	52,015,101	55,900,311	56,315,960	55,936,181
HCPI ¹	138.1	148.0	155.1	160.1	164.5	168.1	170.7	171.9	171.5	173.3
Value (\$) Adjusted ¹	52,828,268	63,817,394	64,077,625	68,128,491	59,332,925	55,583,890	53,721,513	57,331,151	57,892,150	56,904,493
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Lbs. Caught	24,196,581									
Value (\$)	59,245,929									
HCPI ¹	176.3									
Value (\$) Adjusted ¹	59,245,929									

¹ Honolulu Consumer Price Index (all wage earners)

FIGURE 34.

COMMERCIAL FISH LANDINGS BY SPECIES, STATE OF HAWAII, FISCAL YEAR 1999

SEA CATCH BY SPECIES

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)	SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Aku	1,556,484	1,433,223	1,777,476	Gunkan	494	494	645
Ahi (yellowfin)	3,925,792	3,765,721	8,052,713	Kamanu	3,743	3,047	4,289
Ahipalaha (tombo)	2,743,579	2,723,032	3,386,665	Kihikihi (kagami)	307	208	457
Ahi (bigeye)	5,766,470	5,726,670	17,152,492	Lae	650	536	934
Ahi (bluefin)	8,938	8,938	68,049	Menpachi (sasa)	515	482	1,005
Kawakawa	11,197	6,641	7,921	Omaka	200	126	427
Keokeo	68	29	28	Omilu	1,333	755	1,378
Tuna (unclass)	7,663	6,658	11,494	Paopao ¹	---	---	---
Black marlin	9,545	9,075	10,994	Papa	4,041	3,614	6,958
Blue marlin	1,052,583	972,428	1,037,365	White	9,877	9,210	12,202
Sailfish	21,537	21,050	16,030	Ulua/papio(uncl/misc.) ¹	32,863	25,968	53,212
Short spearfish	588,277	552,351	507,639	Panuhunuhu	728	710	1,817
Sriped marlin	1,132,116	1,108,175	1,232,967	Panunu ¹	---	---	---
Swordfish	4,095,309	4,093,515	9,993,676	Uhu	34,822	32,853	75,701
Billfish (unclass)	2,869	2,703	2,486	Kumu	4,731	4,377	29,029
Kaku	21,278	20,089	18,006	Malu	217	175	537
Mahimahi	956,043	879,045	1,980,969	Moana	3,677	2,893	9,689
Malolo ¹	---	---	---	Moana kali	1,775	1,558	10,386
Mola Mola ¹	---	---	---	Munu	382	362	2,386
Monchong	333,731	332,534	402,933	Weke	38,934	35,627	66,031
Ono	879,793	805,328	1,590,984	Weke ula	31,358	28,543	86,259
Opah	1,027,854	1,027,053	1,127,409	Kala	15,717	14,628	16,782
Walu	9,197	4,910	5,536	Kole	2,496	1,624	3,481
Pelagics (misc.)	4,090	4,090	6,106	Maiko	4,770	4,757	2,812
Alfonsin ¹	---	---	---	Manini	15,071	14,239	32,413
Armorhead ¹	---	---	---	Naenae	8,354	8,239	7,355
Ehu	35,854	32,621	117,770	Opelu kala	7,326	7,155	7,879
Golden kale	83	79	166	Pakuikui	1,034	1,012	2,582
Hapuupuu	84,899	81,639	211,825	Palani	37,997	37,334	46,278
Hauliuli ¹	---	---	---	Pualu	7,263	7,178	8,884
Hogo	2,225	1,854	8,078	Kupipi	164	164	228
Kahala	15,839	707	834	Maomao	1,648	1,633	3,147
Kalekale	15,364	13,960	43,508	Alaihe	152	146	339
Lehi	8,736	8,111	25,974	Uu	42,116	39,678	123,992
Opakapaka	192,753	183,154	812,813	Uukanipo	92	80	196
Randall snapper ¹	---	---	---	Aawa	2,152	1,730	1,947
Taape	72,566	65,663	64,067	Ea	313	301	419
Ukikiki (gindai)	6,399	5,719	15,732	Hilu ¹	---	---	---
Uku	121,340	114,399	281,052	Hinalea	273	263	224
Ulaula (onaga)	126,310	118,743	568,413	Kupoupou	11	7	16
Deepbottom (misc.) ¹	55	42	140	Laenihi	4,307	3,262	16,806
Akule	1,076,836	984,561	1,473,189	Poou	29	21	27
Hahalalu	12,932	11,871	18,336	Ahaaha	253	211	243
Opelu	248,299	234,913	411,425	Aholehole	3,774	3,023	7,745
Opelu mama ¹	---	---	---	Amaama	4,091	3,107	9,060
Butaguchi ulua	40,975	38,377	51,315	Awa	1,310	1,145	1,347
Dobe	2,553	2,537	4,256	Awaawa	291	271	262

¹ Due to low level of fishermen reporting and to preserve confidentiality, data for these species are pooled under their respective species group unclassified/miscellaneous or the Uncl./Misc. category.

FIGURE 35.

SEA CATCH BY SPECIES, continued

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Aweoweo	4,207	3,629	9,406
Humuhumu	112	22	11
Iheihe ¹	---	---	---
Kawealea	1,929	1,737	2,859
Makiawa ¹	---	---	---
Moi	1,234	422	1,986
Mu	2,755	2,563	6,461
Nenu	15,580	14,900	16,851
Nohu	686	630	1,637
Nunu	127	124	140
Olililepa	8,368	8,352	10,215
Oio	7,891	6,811	7,146
Pakii	11	11	13
Poopaa	555	501	898
Puhi (white)	170	123	206
Puhi (unclass) ¹	---	---	---
Roi	738	503	1,066
Summer mullet ¹	---	---	---
Tilapia ¹	---	---	---
Toau	2,428	2,237	6,708
Uouoa	656	656	1,526
Upapalu	26	12	2
Wahanui	129	69	85
Mako	76,766	71,288	66,033
Mano kihikihi ¹	---	---	---
Thresher	35,091	21,260	24,384
Tiger	2,920	225	281
Shark (unclass)	184,906	59,636	87,919
Ula (spiny)	53,028	50,706	631,627
Ula (slipper)	56,491	56,308	450,356
Aama	821	791	4,921
Kona	25,500	20,745	96,339
Kuahonu	21,569	21,492	69,976
Moala ¹	---	---	---
Samoan ¹	---	---	---
Crab (unclass)	59	30	100
Ensifer ¹	---	---	---
Laevigatus	214,639	199,087	842,679
Hee (octopus)	19,550	12,905	37,484
Lole (sea cucumber) ¹	---	---	---
Muhee (squid)	2,305	1,872	4,205
Opihi	12,028	10,710	48,787
Pupu ¹	---	---	---
Limu kohu	1,832	1,710	14,996
Limu manaua ¹	---	---	---
Limu ogo	1,466	782	1,988
Limu wawaeiole ¹	---	---	---
Limu (unclass/misc) ¹	2,280	2,092	6,384
Black coral ¹	---	---	---
Unclass/misc. ¹	14,422	12,176	121,117
TOTAL SEA LANDINGS	27,323,357	26,292,071	55,733,429

POND LANDINGS BY SPECIES

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Omitted due to confidentiality			

TOTAL COMMERCIAL MARINE LANDINGS

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
GRAND TOTAL	27,323,357	26,292,071	55,733,429

FIGURE 36.

COMMERCIAL FISH LANDINGS BY SPECIES, STATE OF HAWAII, FISCAL YEAR 2000

SEA CATCH BY SPECIES

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Aku	1,420,946	1,341,133	1,847,695
Ahi (yellowfin)	4,039,043	3,919,639	9,011,727
Ahipalaha (tombo)	3,187,740	3,175,951	3,619,486
Ahi (bigeye)	6,167,401	6,138,812	20,626,808
Ahi (bluefin)	7,143	7,143	69,751
Kawakawa	7,252	4,684	6,458
Keokeo	232	116	225
Tuna (unclass)	13,885	13,588	33,077
Black marlin	10,859	9,199	11,342
Blue marlin	1,011,135	907,859	1,015,096
Sailfish	9,269	8,678	9,556
Short spearfish	385,288	370,256	422,621
Sriped marlin	701,708	687,975	1,106,067
Swordfish	4,111,215	4,100,703	11,098,412
Billfish (unclass)	2,956	2,797	5,047
Kaku	12,506	11,478	14,600
Mahimahi	1,421,025	1,332,530	2,912,159
Malolo ¹	---	---	---
Mola Mola	---	---	---
Monchong	242,914	242,360	451,823
Ono	696,333	635,012	1,519,147
Opah	950,944	950,765	1,243,056
Walu	50,022	49,492	87,307
Pelagics (misc.) ¹	250	220	129
Alfonsin ¹	---	---	---
Armorhead ¹	---	---	---
Ehu	44,413	41,286	157,936
Golden kale	82	78	182
Hapuupuu	54,839	51,833	175,051
Hogo	2,465	2,005	8,005
Kahala	21,373	2,498	3,088
Kalekale	19,863	17,258	52,596
Lehi	10,986	10,246	31,645
Opakapaka	229,719	216,405	956,185
Randall snapper ¹	---	---	---
Taape	64,575	55,491	58,044
Ukikiki (gindai)	6,286	5,566	18,900
Uku	127,248	120,331	323,520
Ulaula (onaga)	193,419	182,540	900,755
Yellowtail kale ¹	---	---	---
Deepbottom (misc.) ¹	41	8	16
Akule	1,166,848	1,083,538	1,623,155
Hahalalu	52,990	37,126	58,059
Opelu	256,187	245,483	442,389
Opelu mama ¹	---	---	---
Butaguchi ulua	27,324	25,056	50,673
Dobe	825	818	1,619

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Gunkan	601	572	810
Kamanu	2,986	2,435	4,059
Kihikihi (kagami)	308	216	346
Lae	613	575	1,071
Menpachi (sasa)	234	156	299
Omaka	---	---	---
Omilu	2,103	1,613	3,508
Paopao	---	---	---
Papa	4,214	4,038	9,099
White	4,931	3,671	5,733
Ulual/papio(uncl/misc.) ¹	20,660	14,243	30,414
Panuhunuhu	652	631	1,647
Panunu ¹	---	---	---
Uhu	31,099	28,916	70,554
Kumu	4,677	4,202	30,573
Malu	161	140	543
Moana	3,890	3,119	10,888
Moana kali	1,505	1,329	8,294
Munu	293	278	1,882
Weke	20,085	19,295	35,941
Weke ula	17,761	15,324	45,244
Kala	14,308	13,796	16,233
Kole	5,358	4,559	8,821
Maiiii ¹	---	---	---
Maiko	4,450	4,394	3,797
Manini	10,446	9,914	22,216
Naenae	7,126	7,119	6,852
Opelu kala	6,025	5,681	5,580
Pakuikui	702	702	1,469
Pala ¹	---	---	---
Palani	31,058	30,566	38,080
Pualu	4,720	4,648	5,962
Kupipi	45	44	40
Maomao	945	923	1,854
Alaihe	261	258	640
Uu	38,933	36,638	116,630
Uukanipo	205	122	356
Aawa	2,417	2,186	2,713
Ea	480	443	805
Hilu ¹	---	---	---
Hinalea	218	209	200
Kupoupou	147	147	479
Laenihi	5,214	3,976	20,584
Poou	14	12	19
Ahaaha	419	409	571
Aholehole	3,066	2,813	8,167
Amaama	3,061	2,887	8,793

Due to low level of fishermen reporting and to preserve confidentiality, data for these species are pooled under their respective species group unclassified/miscellaneous or the Unclass./Misc. category.

FIGURE 37.

SEA CATCH BY SPECIES, continued

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Awa	561	383	610
Awaawa	426	380	362
Aweoweo	3,789	3,517	8,776
Hihimanu ¹	---	---	---
Humuhumu	131	5	7
Kawealea	4,282	4,094	5,283
Makiawa ¹	---	---	---
Moi	885	675	2,609
Mu	2,741	2,593	6,438
Nenue	15,352	14,959	20,374
Nohu	605	557	1,446
Nunu	197	194	284
Olililepa	22,343	22,223	18,598
Oio	3,598	2,839	3,112
Pakii	28	28	27
Poopaa	448	425	813
Puhi (white)	326	313	569
Puhi (unclass)	100	100	70
Roi	807	531	1,230
Saba ¹	---	---	---
Tilapia ¹	---	---	---
Toau	1,644	1,570	4,423
Uouoa	263	248	544
Upapalu ¹	---	---	---
Wahanui	48	22	14
Mako	99,285	93,042	104,233
Mano blue	12,983	0	0
Mano kihikihi ¹	---	---	---
Mano Oceanic whitetip	5,021	61	27
Thresher	30,016	28,104	28,644
Tiger ¹	---	---	---
Shark, unclass ¹	37,463	16,745	22,350
Mano blue (fins)	3,830	3,830	91,798
Mako (fins)	229	229	3,052
Oceanic whitetip (fins)	215	215	6,497
Thresher (fins)	221	221	3,268
Shark, unclass (fins)	456	456	9,793
Ula (spiny)	33,972	32,931	479,326
Ula (slipper)	40,734	40,662	372,669
Aama	1,014	999	6,972
Kona	17,070	12,188	58,785
Kuahonu	13,004	12,873	39,733
Samoan ¹	---	---	---
Crab (unclass) ¹	121	18	206
Ensifer ¹	---	---	---
Laevigatus ¹	---	---	---
Hee (octopus)	26,151	19,784	58,152
Lole (sea cucumber) ¹	116	111	775
Muhee (squid)	3,562	3,276	6,177

SEA CATCH BY SPECIES

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Opihi	10,338	9,134	41,936
Pupu ¹	---	---	---
Limu kohu	1,608	1,571	13,489
Limu manaua ¹	---	---	---
Limu ogo	1,098	517	1,639
Limu wawaeiole	3,129	3,129	2,889
Limu (unclass/misc) ¹	2,386	2,287	6,826
Black coral ¹	---	---	---
Gold coral ¹	---	---	---
Pink coral ¹	---	---	---
Unclass/misc. ¹	25,207	13,480	140,231
TOTAL SEA LANDINGS	27,413,743	26,592,674	62,080,234

POND LANDINGS BY SPECIES

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Omitted due to confidentiality			

TOTAL COMMERCIAL MARINE LANDINGS

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
GRAND TOTAL	27,413,743	26,592,674	62,080,234

FIGURE 38.

SEA CATCH BY SPECIES, continued

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Hihimanu ¹	---	---	---
Humuhumu	140	105	155
Kawelea	3,403	3,360	4,810
Makiawa ¹	---	---	---
Moi	482	406	1,774
Mu	2,475	2,272	6,510
Nenu	9,244	8,946	13,659
Nohu	500	436	1,172
Nunu	84	69	91
Olililepa	13,951	13,605	12,002
Oio	6,052	5,480	5,424
Oopuhue ¹	---	---	---
Pakii	34	34	37
Poopaa	567	546	840
Puhi (white)	231	223	314
Puhi (unclass)	196	181	142
Roi	642	400	1,129
Tilapia ¹	---	---	---
Toau	1,896	1,667	5,832
Uouoa	227	227	542
Upapalu ¹	---	---	---
Wahanui	107	44	68
Mako	64,911	64,411	68,647
Mano blue ¹	---	---	---
Mano kihikihi ¹	---	---	---
Oceanic whitetip ¹	---	---	---
Thresher	51,740	51,559	38,903
Tiger ¹	---	---	---
Shark, unclass ¹	5,035	2,156	1,903
Mano blue (fins)	95	95	2,144
Mako (fins) ¹	---	---	---
Oceanic whitetip (fins) ¹	---	---	---
Thresher (fins) ¹	---	---	---
Shark, misc. (fins) ¹	904	104	697
Ula (spiny)	8,601	7,657	88,969
Ula (slipper)	114	107	1,011
Aama	296	295	1,567
Kona	10,128	6,356	27,615
Kuahonu	9,002	8,806	27,300
Moala ¹	---	---	---
Samoan ¹	---	---	---
Crab, unclass ¹	226	183	543
Ensifer ¹	---	---	---
Laevigatus	6,307	6,287	53,034
Shrimp, unclass ¹	---	---	---
Hee (octopus)	25,179	20,189	58,466
Muhee (squid)	4,832	3,951	9,185
Opihi	11,965	11,384	57,727
Wana (sea urchin) ¹	---	---	---

SEA CATCH BY SPECIES, continued

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Limu kohu	1,941	1,880	16,461
Limu manauea ¹	---	---	---
Limu ogo	4,240	3,363	10,785
Limu wawaeiole	7,328	7,328	6,317
Limu (unclass/misc) ¹	1,156	1,110	5,286
Black coral ¹	---	---	---
Unclass/misc. ¹	22,054	7,508	73,141
TOTAL SEA LANDINGS	21,111,533	20,316,310	45,383,865

POND LANDINGS BY SPECIES

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Aholehole ¹	---	---	---
Amaama ¹	---	---	---
Awa ¹	---	---	---
Awaawa ¹	---	---	---
Kaku ¹	---	---	---
Kawelea ¹	---	---	---
Lae ¹	---	---	---
Moi	---	---	---
Oio ¹	---	---	---
Pualu ¹	---	---	---
Tilapia ¹	---	---	---
Toau ¹	---	---	---
Omilu ¹	---	---	---
Menpachi (sasa) ¹	---	---	---
Ulua/papio (unclass) ¹	---	---	---
Miscellaneous	6,427	6,422	13,040
TOTAL	6,427	6,422	13,040

TOTAL COMMERCIAL MARINE LANDINGS

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
GRAND TOTAL	21,117,960	20,322,732	45,396,905

FIGURE 39.

COMMERCIAL FISH LANDINGS BY SPECIES, STATE OF HAWAII, FISCAL YEAR 2000-2001

SEA CATCH BY SPECIES

SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)	SPECIES	LBS LANDED	LBS SOLD	VALUE (\$)
Aku	1,526,001	1,443,409	1,830,580	Gunkan	432	413	646
Ahi (yellowfin)	4,505,585	4,389,176	11,189,187	Kamanu	3,068	2,339	3,534
Ahipalaha (tombo)	2,772,728	2,760,687	3,320,280	Kihikihi (kagami)	323	311	372
Ahi (bigeye)	4,374,889	4,338,299	14,808,759	Lae	345	309	577
Ahi (bluefin) ¹	---	---	---	Menpachi (sasa)	450	300	548
Kawakawa	11,610	7,795	10,071	Omaka ¹	---	---	---
Keokeo	318	154	216	Omilu	2,307	1,688	3,704
Tuna (unclass) ¹	1,497	1,396	5,378	Paopao ¹	---	---	---
Black marlin	15,556	14,294	15,656	Papa	2,838	2,419	4,603
Blue marlin	972,293	866,085	951,742	White	6,907	6,177	9,906
Sailfish	6,982	6,559	7,290	Ul原因/papio(uncl/misc.) ¹	27,296	22,120	44,531
Short spearfish	272,479	255,434	243,168	Panuhunuhu	1,038	1,000	2,753
Sriped marlin	559,100	534,319	785,837	Uhu	24,493	23,434	56,264
Swordfish	632,829	632,456	2,080,738	Kumu	4,740	4,395	30,058
Billfish (unclass)	6,506	6,459	7,592	Malu	155	143	506
Kaku	19,225	17,801	13,985	Moana	2,865	2,390	8,252
Mahimahi	1,255,739	1,170,413	2,183,949	Moana kali	1,037	787	4,709
Malolo ¹	---	---	---	Munu	174	146	918
Mola Mola ¹	---	---	---	Weke	21,054	20,225	40,078
Monchong	187,009	186,289	323,040	Weke ula	14,216	12,461	37,537
Ono	918,140	825,888	1,585,912	Kala	20,390	20,123	23,029
Opah	572,251	572,036	848,777	Kole	1,920	1,517	3,084
Walu	97,902	97,857	170,986	Maiko	4,766	4,740	3,525
Pelagics (misc.) ¹	189	189	30	Manini	12,819	12,450	27,330
Alfonsin ¹	---	---	---	Naenae	7,406	7,401	7,459
Ehu	38,248	35,028	135,744	Opelu kala	5,275	5,091	4,369
Golden kale	80	59	123	Pakuikui	468	448	583
Hapuupuu	37,859	36,063	128,339	Palani	32,279	31,980	41,229
Hauliuli ¹	---	---	---	Pualu	6,220	6,196	7,927
Hogo	2,615	2,355	9,844	Kupipi	61	59	72
Kahala	21,110	3,457	3,288	Maomao	713	654	1,212
Kalekale	18,461	16,476	50,178	Alaihe	186	181	299
Lehi	11,150	9,599	29,016	Uu	36,486	33,887	105,815
Opakapaka	184,921	174,303	747,737	Uukanipo	89	86	240
Randall snapper ¹	---	---	---	Aawa	2,530	2,248	2,568
Taape	54,160	46,761	47,492	Ea	148	141	248
Ukikiki (gindai)	5,441	4,733	14,200	Hilu	125	123	257
Uku	110,894	105,667	268,183	Hinalea	387	371	459
Ulaula (onaga)	125,141	118,573	591,591	Kupoupou	87	85	302
Yellowtail kale ¹	---	---	---	Laenihi	4,170	3,114	19,193
Deepbottom (misc.) ¹	42	34	98	Pou ¹	---	---	---
Akule	939,274	850,684	1,308,774	Ahaaha	593	574	692
Hahalalu	16,539	15,744	28,149	Aholehole	2,023	1,755	5,818
Opelu	254,727	245,752	439,549	Amaama	6,125	5,711	17,042
Opelu mama ¹	---	---	---	Awa	1,939	1,931	1,827
Butaguchi ulua	39,720	34,561	59,043	Awaawa	219	219	179
Dobe	1,461	1,450	2,620	Aweoweo	3,415	3,144	8,267

¹ Due to low level of fishermen reporting and to preserve confidentiality, data for these species are pooled under their respective species group unclassified/miscellaneous or the Unclass./Misc. category.

harvested by trappers. Some of the fishing vessels migrated from the west coast and other large vessels were converted from the longline fishery. Despite relatively high ex-vessel prices, many of the fishing vessels do not remain in this fishery, because of the difficulty of finding a durable market.

Inshore Fin-Fishes

The inshore fin-fish resources receives fishing pressure from trap, net, dive, and handline activities. Except for surgeonfishes, landings for the other species were cyclical, but show gradual decline at the end of the decade. Many of these species, especially the parrotfishes need relief from fishing pressure, therefore, the Department is in the process of revising the Administrative Rules. Fishing regulations will be amended or established for gear, minimum size, closed seasons, and bag limits.

FRESHWATER PROGRAMS

The Division of Aquatic Resources is charged with managing the aquatic life of the 376 perennial and numerous, intermittent streams as well as the four public fishing areas on the main Hawaiian Islands. These public fishing areas are: Wahiawā Public Fishing Area, Nuʻuanu Reservoir Number 4, Kōkeʻe Fishing Area, and Waiakea Public Fishing Area

PROGRAM OVERVIEW

The freshwater programs include: freshwater stream surveys, fish kill investigations, fish stocking, public fishing, environmental comments pertaining to stream eco-systems and educational outreach on freshwater species.

On Oʻahu there are four freshwater specialists. On the Neighbor Islands, biologists accomplish freshwater and marine investigations for Hawaiʻi, Maui, Molokaʻi, and Kauaʻi.

At the Anuenue Fisheries Research Center (AFRC) catfish, and rainbow trout are

raised for recreational fishing. The juveniles are dispersed in reservoirs on Kauai and Oʻahu.

FRESHWATER FLORA

The number of freshwater plants, algae, diatoms, aquatic plants or macrophytes is currently unknown. One of the goals of the freshwater vegetation control project is to deal with problems that exist with invasive freshwater plants such as: water hyacinths (*Eichhornia carssipes*), aquatic ferns, (*Salvinia molesta*), elodia, *Elodia (canadensis)* and eel grass, (*Vallisneria*). These alien species sometimes incur significant economic clean up costs because they obstruct access to freshwater fishing areas, they block light penetration to the reservoir, upsetting the ecological balance, and when the plants die, the decaying plant material uses up oxygen. They also block water ways and drainage channels. Periodically, the DLNR crews from the DOFAW or the DAR, remove these plants from public fresh water areas such as Lake Wilson, drainage canals and from Kawainui Marsh. During the period 1997-1998 several employees spent two years successfully eradicating a water hyacinth bloom on Lake Wilson. General funds, special funds and federal funds are spent on these problems. Problems have been made worse because several technician positions have gone unfilled creating a shortage of available workers within the division.

FRESHWATER FAUNA

Native species in freshwater streams include five species of fish known collectively as ʻoʻopu, two species of shrimp known as ʻōpae, limpets known as hihiwai and hapawai, a freshwater sponge, many species of aquatic

insects and other invertebrates and a wide variety of algal and diatom species. Many of these are found nowhere else in the world. The fishes, shrimps and limpets have amphidromous life cycles - spending the early stages of their lives in the ocean. Artificial freshwater impoundments hold many additional species, most of which were introduced by man.

Four waves of successful introductions of aquatic organisms to Hawaiian freshwaters have occurred. The first, prior to 1900, totalled 6 fish, 1 frog, and 1 turtle species, most of which were linked culturally to the immigration of Asian workers. The second between 1900 and World War II, was comprised of some 10 fishes, 1 crayfish and 3 amphibians for purposes of



DAR stream biologists Mike Yamamoto and Annette Tagawa at work. Photo credit: the DAR.

mosquito control and recreation. The postwar years 1946-1961 saw a third wave of 10 fish species introductions for the purposes of vegetation control, aquaculture, aku bait production and recreation plus one possible aquarium escapee. During that period an operational concept of impoverished natural fauna led to the release of the Tahitian prawn, *Macrobrachium lar* sp., which now infests many of our stream habitats. The next twenty years were relatively quiescent but one serious accidental introduction occurred when the blackchin tilapia escaped from an aku bait facility.

The fourth wave of introductions began in the 1980's, during which more than 25 species of fish, macro-invertebrates, and a turtle appeared in our streams and reservoirs. Virtually all originated from the aquarium fish trade and some were clearly harming native species and game fish populations. They have reached greatest abundance in lower stream reaches that were already disturbed by human activity and may in part be symptoms rather than causes of environmental degradation. Fish diseases as well as other noxious species have probably been introduced along with the aquarium fish. The rate of discovery of new species has been markedly reduced since measures were implemented in the 1990's to curb further introductions.

The freshwater streams contain many different kinds of endemic invertebrates such as hihiwai, one of three types of brackish/neretid snails. The others are hapawai and pipiwai. There are also pond snails and a species of freshwater sponge.

SURVEY OF RESOURCES

The budget of the DAR for freshwater programs is approximately \$905,000. This funding is from the Dingle-Johnson/Wallop Breaux Sport Fish Restoration Act. This represents approximately one-fifth of the total spending on the program.

Hawaiian Streams 2002

Hawaiian streams somewhat resemble streams on the mainland U.S. but are generally shorter and steeper in slope. Only about 7% of the islands' 376 perennial streams are 10 miles or longer and are punctuated by numerous spectacular waterfalls, which gives these streams a steep profile. An extreme case is Akaka Falls on the Big Island, which is estimated to be about 420 ft. high. Many tourists are awed by these extreme waterfalls but are unaware that Hawai'i native stream animals regularly ascend and descend these falls during their migrations.

The native aquatic fauna is represented by three disparate groups of animals: three mollusk or wi, two crustaceans or 'ōpae, and five species of fishes, known collectively as 'o'opu. These nine native animals all share a unique life cycle, called amphidromy. Adults live and reproduce in streams where the eggs hatch and the larvae drifts out to sea. After several months, the juvenile stages of these animals migrate inland to its adult habitat. This life cycle require these animals to cross the estuary, or muliwai, twice. These migration events are usually induced by episodic flood events geared to rainfall patterns typical of Pacific High Island eco-systems.

Hawai'i's streams were once richly supplied with healthy populations of wi, 'ōpae, and 'o'opu. As Hawai'i's population exploded in the early 1900's, rapid agricultural development and urbanization followed with all its attendant impact and contributed to the decline of native stream animals. Water diversions, stream channelization, dumping of waste, uncontrolled sediment runoff and alien fish introductions are still major threats, especially on heavily populated areas such as on O'ahu and Maui. Every effort is being made to work cooperatively with other agencies to mitigate these impacts.

There are still many streams, especially in the rural and remote areas of the neighbor islands, which contain reasonably healthy populations of native stream animals. Every effort is



Fisheries Technician Darrel Kuamo'o conducting a stream survey on Maui. Photo Credit: the DAR.

being made to protect and use them as benchmarks in developing tools and methods for rehabilitating impacted streams as well as for water resource planning and management.

The division believes that water-use decisions should be based on the principle of "no net loss of habitat for native stream biota" and has funded projects to address this issue. The most recent breakthrough is the development of a cutting edge GIS-based habitat model that can be used as a tool for managing water resources without impacting native biota. The model is presently undergoing field-testing.

Maintaining the natural flow patterns in streams is the single most important requirement

for protection of native stream biota. These natural flows will keep the river mouth open and provide the gateway for these animals to complete their life cycle. Native Hawaiian stream life, like the native Hawaiian people, depend on the streams which embody the connection of mauka (mountain) to makai (ocean) that defines the ahupua'a or ecosystem approach in resource management.

HIGHLIGHTS

As a consequence of recent court actions to restore stream life on Windward O'ahu, new funding has come from the State Water Commission for basic research to define the populations and abundance in Hawaiian streams.

An ongoing program is being conducted to identify, control and eradicate noxious alien species in streams and reservoirs. This includes alien aquatic plants, invertebrates and fish. A new in-stream development model is currently being tested that will provide information on how life in the streams responds to altered and/or diminished stream flows. All development projects near streams and reservoirs are reviewed for possible pollution impacts.

In separate efforts, to provide recreational fishing opportunities, catfish and trout are reared at Ānuenue Fisheries Research Center on Sand Island and juveniles are released in public fishing areas. Catfish are stocked annually in Nu'uuanu Reservoir. Trout are stocked in the Kōke'e Public Fishing Area.

RECREATIONAL FISHERIES PROGRAM

This program protects, restores, and conserves fishery resources, increases the quality, quantity, and diversity of recreational fishing opportunities in both fresh and salt water; and enriches the leisure time of people of all ages by providing opportunities and facilities for developing skills and participating in other non-organized outdoor

recreation such as snorkeling, underwater photography, and nature studies of aquatic organisms and their habitats.

PROGRAM ACCOMPLISHMENTS FY 1998-99

■ Conducted three openings of Nuuanu Reservoir No. 4, O'ahu for catfish fishing. During 47 days of fishing, 6,571 anglers caught 2,380 channel catfish. 6,000 catfish were stocked into the reservoir.



Biologist Brian Kanenaka with trout grown and stocked by the DAR. Photo Credit: the DAR.

■ Opened Kōke`e Public Fishing Area, Kaua`i, to rainbow trout fishing. During 30 days of fishing, 2,956 anglers caught 9,294 trout. 50,000 trout fingerlings were stocked in Pu`u Lua Reservoir or released into Kōke`e streams.

PROGRAM ACCOMPLISHMENTS FY 1999-2000

■ Conducted three openings of Nu`uanu Reservoir No. 4, O`ahu for catfish fishing. During 41 days of fishing, 4,642 anglers caught 2,922 channel catfish. 10,000 catfish were stocked into the reservoir.

■ Opened Kōke`e Public Fishing Area, Kaua`i, to rainbow trout fishing. During 30 days of fishing, 2,690 anglers caught 8,520 trout. 50,000 trout fingerlings were stocked in Pu`u Lua Reservoir or released into Kōke`e streams.

■ Initiated studies to determine the influence of water temperature on native gobies returning from initial oceanic portion of life cycle and to test for possible effects of agricultural runoff on recruiting gobies.

■ Identified a new occurrence of fish leech on native gobies in Wailoa River that was possibly introduced by game fish brought to Hawai`i in the 1950s.

PROGRAM ACCOMPLISHMENTS FY 2000-2001

■ Conducted aquatic resource curriculum workshops for teachers; reached over 2,900 students through classroom presentations; conducted conservation education courses for nearly 1,300 participants; reached thousands of members of the general public through presentations and displays at various events; distributed over 65,000 pieces of printed material; produced new educational poster on Hawai`i's jacks.

■ Continued airing 30-second television spots on catch-and-release, fishing safety, marine debris, and release of exotic fish; produced new spots on fishing conservation and gill nets.

■ Produced 3 issues of division newsletter Current Line (issues July 2000, November 2000, March 2001).

■ Conducted three openings of Nu`uanu Reservoir No. 4, O`ahu for catfish fishing. During 42 days of fishing, 5,881 anglers caught 3,038 channel catfish. 8,000 catfish were stocked in the reservoir.

■ Opened Kōke`e Public Fishing Area, Kaua`i to rainbow trout fishing. During 28 days of fishing, 1,560 anglers caught 4,314 trout. 40,000 trout fingerlings were stocked in Pu`u Reservoir or released in the ditches.